The Metals REVIEW

OWNED AND PUBLISHED BY THE MEMBERS OF THE AMERICAN SOCIETY FOR METALS

THE MONTHLY SURVEY AND DIGEST OF WHAT'S NEW IN METALS

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Rustless Engineers Perfect Pyrometer For Molten Steel

A practical and accurate way of measuring temperatures of molten steel up to 3200° F. in an electric arc melting furnace has been developed by L. F. Weitzenkorn and G. C. Klingel, metallurgical engineers at Rustless Iron and Steel Corp., Baltimore.

By adapting and improving upon a British device, these engineers devised a platinum thermocouple pyrometer which measures the temperature of a steel bath before the heat is tapped from the melting furnace, the reading being recorded by an electronic instrument.

This new pyrometer goes a step beyond the optical pyrometer since it measures the temperature of the heat of steel in the melting furnace—even though the steel is covered with a layer of slag—at a time when steps can be taken to regulate and control the temperature. The pyrometer consists of two interchangeable parts, an immersion head (a platinum and platinum-rhodium thermocouple encased in a fused silica tube mounted in a block of graphite) and a handle which is a 12-ft. insulated pipe containing the wires leading to an electronic recorder.

L. F. Weitzenkorn (right) and G. C. Klingel (left) examine the platinum thermocouple they developed recently at Rustless Iron and Steel Corp.

The operator of the device simply manipulates the immersion head, mounted on the pipe handle, through the door of the electric furnace and dips it into the steel bath. The exposed tip of the silica tube which contains the platinum thermocouple wires is immersed in the bath and the graphite block is in contact with the metal, the slag layer and the hot atmosphere of the furnace. The whole operation, which is automatically recorded, takes about 45 sec. The instrument by which the measured temperature is recorded is equipped with a large pointer and dial calibrated in degrees Fahrenheit. This recorder is mounted conveniently near the furnace where it is easily visible to the melter.

Mention R753 When Writing or Using Reader Service.

More New Products on Pages 18 *and* 19

Talk and Film Tell About Ferrous and Non-Ferrous Forging

Reported by W. T. Rubin
Metallurgist, Copperweld Steel Co.

The principles of "Ferrous and Non-Ferrous Forging Practice" were interestingly presented at the January meeting of the Warren Chapter by R. W. Thompson, sales engineer for Transue & Williams Steel Forging Corp., Alliance, Ohio.

Mr. Thompson stated that the main classes of forgings are closed die and flat die forgings. The speaker presented many examples of both types in both ferrous and non-ferrous metals. At the conclusion of the lecture, an excellent film was shown.

Convention Papers Invited

IT HAS BEEN deemed advisable for the various committees concerned with the arrangement of the technical program and educational lectures for the annual convention of the American Society for Metals to proceed as usual in securing papers and lecturers. This is desirable so that if at a later date Assistant President Byrnes states that conventions and expositions would again be permissible the programs would be ready for presentation as soon as the "green light" is given.

Consequently a cordial invitation is extended to all members of the Society to submit technical papers to the Publication Committee for its consideration.

Three copies of the paper accompanied by three sets of drawings and illustrations must be sent to the National Office in Cleveland to the attention of Ray T. Bayless, assistant secretary, American Society for Metals, not later than June 1, 1945. Headquarters should be notified immediately of your intention to submit a paper.

Helpful suggestions for the preparation of technical papers will be sent to all who indicate their intention to submit papers for the program.

What's NEW..... in THE METALS REVIEW

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PASS-A-ROUND

Many executives in your plant will want to see this record of what happened last month in the metal industry. Just fill in the names, note items for special attention — and Pass-A-Round.

Name	Item No.

New Electronic and Magnetic Inspection Systems in Wide Use

Reported by R. R. Robinson
Technical Engineer, Colorado Fuel & Iron Corp.

Uses of some new magnetic and electronic inspection methods and equipment, as well as limitations of such processes, were outlined to members of the Pueblo Group, American Society for Metals, meeting Dec. 14. The speaker was P. E. Cavanagh, chief metallurgist for the Allen B. DuMont Laboratories of Passaic, N. J., and inventor of one magnetic testing system.

Use of the cathode ray tube, which also is employed in radar and television, was featured in some of the testing methods which Cavanagh described.

Tests which are possible by the various methods include checks for strains and stresses on various products of the metallurgical industry; discovery of flaws, cracks and other defects; determination of the thickness of walls of hollow objects, such as airplane propellers or gasoline tanks.

Different grades of steel in bar stock can be determined by one type of test. Where a consignment has been rejected because some of the individual pieces have contained flaws, the testing system can quickly determine which of the lot are good and which are bad. One such example was cited as outstanding; a consignment of vitally needed parts for motorized equipment was rejected because some were found imperfect. Case depth was below specifications on a large percentage of the parts. Old methods of checking would have required four months to complete, but by means of the electronic system, six hours was all that was required to sort out some good pins and have production underway again.

Testing devices can be set up so that, in production of some articles, imperfect ones are automatically thrown out, or marked with paint, or indicated by the ringing of a bell.

Some of the tests, however, are not sensitive enough for fine gradations of quality, and because not all magnetic qualities are taken into account, it is possible to get pieces of entirely different quality which would have the same reading. By using more than one frequency, on the other hand, that danger is obviated. One other disadvantage of some of the methods is that the human angle—the interpretation given the reading—is the determining factor.

Rubber Press and Spot Welding Take Limelight in Aircraft Tour

Reported by E. W. Marshall
Chief Inspector, Ottawa Car and Aircraft, Ltd.

At the invitation of the directors of Ottawa Car and Aircraft, Ltd., 40 members of the Ottawa Valley Chapter of the A.S.M. made a tour of the aircraft plant on Jan. 24. Some of the intricacies in the fabrication of large aircraft components were viewed at first hand; a large rubber press and the spot welding department were two centers of particular attraction.

After the visit light refreshments were provided for the members. Chairman Gordon S. Farnham extended the thanks of the group to the directors, Mr. Patterson, general manager, S. Salmon, works superintendent, and E. W. Marshall, chief inspector, and their staff who so kindly acted as guides through the plant.

Wormser Secretary of Metal Powder Assoc.

The Board of Directors of the Metal Powder Association have elected Felix Edgar Wormser acting secretary and treasurer and have moved the offices of the Association to 420 Lexington Ave., New York 17, N. Y. Mr. Wormser is also secretary and treasurer of the Lead Industries Association at the same address.

A.S.M. REVIEW OF CURRENT METAL LITERATURE

An Annotated Survey of Engineering, Scientific and Industrial Journals and Books Here and Abroad, Received in the Library of Battelle Memorial Institute, Columbus, Ohio, During the Past Month

1. ORES & RAW MATERIALS

Production: Mining: Beneficiation

1-1. **Thermal Methods for Hydrogen Production.** D. D. Howat. *Chemical Age*, v. 51, Dec. 9, '44, pp. 539-543.
Steam-iron process.

1-2. **Iron Ore Beneficiation Assumes a Major Role in the Manufacture of Pig Iron.** Wm. A. Haven. *Blast Furnace & Steel Plant*, v. 33, Jan. '45, pp. 81-83, 89.
Developments in the beneficiation of blast furnace raw materials, which offer opportunities for increasing production and for reducing costs in the manufacture of pig iron.

1-3. **Recent Developments in Iron Ore Beneficiation in the United States.** T. B. Counselman. *Blast Furnace & Steel Plant*, v. 33, Jan. '45, pp. 90-95, 156, 160-161.
Mesabi ores; use of turbos; the Dorrco Sizer; flotation; treatment of magnetic taconites; concentration of brown ores; concentration of red ore; treatment of ores in eastern magnetite area; East Texas iron ores.

1-4. **Large Scale Working of Adirondack Magnetites.** Frank J. Oliver. *Iron Age*, v. 155, Jan. 25, '45, pp. 50-55.
Mines abandoned years ago reopened, active mines greatly expanded in activity and $40,000,000 worth of modern mining and concentrating equipment has been installed to produce a high grade magnetite sinter from ores ranging from lean to rich. Depletion of high grade Lake Superior ores lends them a new importance. Economic factors compared in order to evaluate the permanence of this activity and its influence on blast furnace practice.

2. SMELTING AND REFINING

2-1. **Fluxing Aluminum and Its Alloys.** James L. Erickson. *Western Metals*, v. 2, Dec. '44, pp. 26, 28, 31.
Degassers; refining fluxes; modification; general remarks. 20 ref.

2-2. **Magnesium in the Pacific Northwest.** Nathanael H. Engle. *Western Metals*, v. 2, Dec. '44, pp. 41-42.
Developed by the Electro Metallurgical Co. and used to a limited degree before the war, process is differentiated from the Pidgeon process by the type of furnace used. Spokane operation uses electric refractory furnaces, each of which has a capacity approximately equivalent to 100 retorts. Calcined dolomite and ferrosilicon are used in each process, but the much larger furnace units greatly increase economy of operation.

2-3 **Quasi-Bessemerising Process.** W. S. Williams. *Iron & Steel*, v. 17, Dec. '44, p. 714.
Silicon and phosphorus as controls of the graphite "throw."

2-4. **Quality Steels—Today and Tomorrow; Present Steelmaking Processes.** Earle C. Smith. *Metal Progress*, v. 47, Jan. '45, pp. 79-82.
Description of the producing units serves as a foundation for the comparison of their usefulness.

2-5. **Quality Steels — Today and Tomorrow; Future Changes Reasonably to Be Expected.** H. B. Emerick. *Metal Progress*, v. 47, Jan. '45, pp. 82-83.
Ore supplies and influence on iron smelting. Bessemer and electric processes. Constantly increasing uses for modernized instrumentation, automatic control systems, and broader metallurgical control of all iron and steel making operations.

2-6. **Developments in the Production and Technology of Magnesium and Its Alloys.** F. A. Fox and G. Goddard. *Metallurgia*, v. 31, Dec. '44, pp. 70-74.
Consideration given to the main developments in magnesium technology during 1944, both in England and abroad; extraction process development; fabrication process development; engineering process development; research developments. 51 ref.

2-7. **Electric Furnace Alloy Steel Plant Expanded by A. M. Byers Company.** *Industrial Heating*, v. 12, Jan. '45, pp. 71-72, 74, 76, 78, 80, 82, 104.
Alloy steel production facilities at this plant have been expanded by the installation of additional electric arc furnace capacity, along with auxiliary equipment. A general view of the present plant interior is shown.

2-8. **Recent Metallurgical Developments in Steelmaking.** H. B. Emerick. *Blast Furnace & Steel Plant*, v. 33, Jan. '45, pp. 96-99.
Steel making capacity in the United States is now rated at 94,054,550 net tons of steel ingots and castings per year. Blast furnace capacity for producing pig iron and ferro-alloys is rated at 68,446,310 net tons annually. Hot metal; temperature control; segregation problems; deoxidation and slag control; alloy steels; National Emergency steels; needled steels; hardenability bands.

2-9. **Basic O. H. Slags.** Brian Mason. *Iron & Steel*, v. 17, Dec. 7, '44, pp. 770-773.
Determination of their chemical composition and constitution.

2-10. **Ironmaking.** *Iron & Steel*, v. 17, Dec. 7, '44, pp. 806-809.
Practice and development at Appleby-Frodingham.

2-11. **Blast-Furnace Practice.** *Iron & Steel*, v. 17, Dec. 7, '44, pp. 809-820.
Abridged report. Introduction; fuel consumption and economy; furnace operation and problems; preparation of the burden; furnace and stove refractories.

2-12. **Operates Open Hearths on All Scrap-Carbon Charge.** Paul S. Kingsley. *Steel*, v. 116, Jan. 22, '45, pp. 106-107, 109.
Practice in cold-iron shops particularly when cheap scrap is available affords low mix costs. Sulphur kept within bounds by the use of spiegel or the charging of high-manganese crops. Sequence of charging parallels conventional method. Control of shop operations similar to that applicable to pig-scrap charge.

2-13. **Effects of Water Vapor, Carbon Reactions and Temperature in Brass and Bronze Melting.** H. L. Smith. American Foundrymen's Association *Transactions*, v. 52, March '45, pp. 846-853.
Solubility of hydrogen; effect of carbon monoxide and carbon dioxide; furnace atmospheres; melting conditions.

STARTING with this issue of THE METALS REVIEW, *a few changes have been made in the 27 classifications of the A.S.M. Review of Current Metal Literature. The changes are minor and the old classification has been followed as closely as possible. The major revisions occur in Sections 1, 2, 3, 7, 9, 12, and 21.*

All installments which appeared during the past year from February 1944 through January 1945 are now being collected into a bound volume which will be ready for distribution in about 90 days. The book will sell for $10.00 per copy, and should be ordered from the American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio.

3. PROPERTIES OF METALS AND ALLOYS

3-1. **Palladium.** *Electrochemical Society Bulletin*, Dec. '44, pp. 3-4.
Source and uses.

3-2. **Low-Alloy Cast Steels.** H. A. Schwartz and W. K. Bock. *Iron & Steel*, v. 17, Dec. '44, pp. 715-720.
Shows that tensile strength plotted against elongation gives a straight line, calculable from the chemical composition. This applies only to normalized or quenched steels, the latter tempered above 400° C. 4 ref.

3-3. **The Effect of Copper in Some NE and Low-Alloy Cast Steels.** C. T. Greenidge, M. C. Udy, and K. Grube. *Western Metals*, v. 2, Dec. '44, pp. 11-14, 16, 19-20.
In tests on four different alloy steels, three of which corresponded to NE grades, the presence of copper up to 50% did not change the tempering temperature required to obtain the desired hardness in full quenched specimens. When normalized, however, the steels showed a mild increase in as-normalized hardness as copper was raised from 0 to 0.50%. 9 ref.

3-4. **Non-Ferrous Metallurgy.** Bruce W. Gonser and R. I. Jaffee. *Iron Age*, v. 155, Jan. 4, '45, pp. 73-75, 180G-180H.
New alloys and improved surface treatments are winning the light metals an excellent postwar competitive position. The minor or unusual metals are enjoying a spurt in application, and new treatments for copper and new bronzes attract favorable attention.

3-5. **High-Strength Aluminum Alloys for Light Weight Structures.** Max E. Tatman and Roy A. Miller. *Product Engineering*, v. 16, Jan. '45, pp. 6-11.
To aid those who do not have the time to follow closely the new developments in materials, "super aluminum" alloys in general are discussed with emphasis on possible combinations, practical from a production standpoint, that achieve the best strength-weight ratios for light weight structures. Alloys and characteristics are compared and evaluated.

3-6. **New Aluminum Casting Alloys Strong as Cast.** Hiram Brown. *Metals & Alloys*, v. 20, Dec. '44, pp. 1616-1619.
Types of strong as-cast aluminum alloys in existence; presents their properties and indicates their present and potential fields of application.

3-7. **Acid-Resisting Steels.** *Chemical Age*, v. 51, Dec. 2, '44, pp. 521-524.
Most important corrosion and acid resistant steels which today are employed in the chemical industry are shown. Also gives a review of their mechanical properties, structure and grain stability. Main constructional applications are for such purposes as vessels, plant, piping, etc.

3-8. **New Wrought Aluminum Alloys for Aircraft and New Temper Modification of Present Alloys.** Don A. Lawless. *Aeronautical Engineering Review*, v. 3, Dec. '44, pp. 25, 27, 29.
Properties and application possibilities of the new alloys and tempers reviewed briefly. 3 ref.

3-9. **Flow and Fracture.** P. W. Bridgman. *Metals Technology*, v. 11, Dec. '44, pp. 32-43.
Stress history; interconnection of flow and stress; stresses with two degrees of freedom; stress distribution at neck; fracture; McAdam's metnod.

3-10. **Conditions of Fracture of Steel.** J. H. Hollomon and C. Zener. *Metals Technology*, v. 11, Dec. '44, pp. 44-58.
Flow stress and fracture strength obtained over a wide range of temperature and of strain rate for both pearlitic and a tempered martensitic steel at two stress levels. Effect of deformation upon fracture strength obtained for a pearlitic steel. Observations indicate that deformation has a negligible effect upon the fracture strength of the tempered martensitic steel. In the yield-strength ranges of the steels examined, only the pearlitic steels were brittle at high strain rates and at low temperatures. 7 ref.

3-11. **Some Speculations Regarding the Plastic Flow and Rupture of Metals Under Complex Stresses.** L. R. Jackson. *Metals Technology*, v. 11, Dec. '44, pp. 59-79.
Capacity of a metal for plastic flow before rupture is dependent on the type of stress system applied. Means of representing the effect of complex stresses on plastic flow. Methods of obtaining complex stress distribution. Experimental results showing the effect of types of complex stress on the capacity of various metals for flow. 9 ref.

3-12. **Deformation of Metals.** H. W. Swift. *Metallurgia*, v. 31, Dec. '44, pp. 53-62.
An engineer's assessment of the problems involved in the mechanics of stress and strain, and of the contributions which can be made to it by the application of mechanical principles.

3-13. **Bearing Strength in Airplane Design.** Albert Epstein. *Journal of the Aeronautical Sciences*, v. 12, Jan. '45, pp. 67-84.
Bearing stress criteria for aluminum alloys, if applied to heat treated steel, would permit allowable stresses as much as 50% greater than those used at present for steel. Allowable strength values for some single-rivet joints may be almost as high as the acting failing strength. In several applications, described, it is desirable to use some factor or margin of safety with these values because of discrepancies between computed and actual rivet loads. 18 ref.

3-14. **Some Thoughts on Medium and High Tensile Wrought Alloy Steels, Present and Future.** J. H. G. Monypenny. *Metallurgia*, v. 31, Dec. '44, pp. 79-82.
Consideration given to the types of low alloy steels developed in the last few years and to the need for eliminating restrictions from specifications for alloy steels in the postwar years.

3-15. **Copper and Copper Alloys.** H. J. Miller. *Metallurgia*, v. 31, Dec. '44, pp. 83-87.
The industry is not only concerned with increased production, but is persistent in its efforts to improve the quality of products; incorporates the more outstanding contributions to progress during the present year.

3-16. **Progress in Research Methods in the Metallurgy of Cast Iron with Special Reference to Gases in Cast Iron.** J. E. Hurst. *Metallurgia*, v. 31, Dec. '44, pp. 92-97.
Progress in research methods in relation to a recurring problem experienced in the iron foundry; composition, constitution and properties of cast iron.

3-17. **Silicon Bronzes.** *Machine Design*, v. 17, Jan. '45, pp. 163-167.
Analyses, properties, characteristics, applications, fabrication, resistance to corrosion, annealing, material designations, trade names.

3-18. **The Influence of Arsenic and Bismuth on the Mechanical Properties of Copper-Nickel-Phosphorus Alloys.** Clement Blazey. *Australasian Institute of Mining & Metallurgy*, no. 135, Sept. 30, '44, pp. 65-81.
Precipitation-hardening properties of the copper-nickel-phosphorus alloys, and influence of arsenic and bismuth, singly and together, on the mechanical properties of these alloys. 3 ref.

3-19. **Influence of Nitrogen on the Properties of Certain Austenitic Valve Steels.** *V.D.I. Zeitschrift*, v. 88, March 4, '44, p. 133.
The alleged favorable influence of nitrogen additions to highly heat resistant chromium-nickel alloy steels could not be confirmed. Further investigations are being performed.

3-20. **How Much Ductility Is Necessary for a Structure or Machine?** W. J. Conley. *Welding Journal*, v. 24, Jan. '45, pp. 51-56.
Interesting discussion of ductility and comments on its significance in welded structures. 29 ref.

3-21. **Stresses in Welded Structures.** H. C. Boardman. *Welding Journal*, v. 24, Jan. '45, pp. 57s-60s.
Fusion welded structures of plain low carbon steels having well-defined plastic yield ranges at about one-half of the ultimate strength. These ranges are for uniaxial (one-directional) stresses.

4. STRUCTURE

Metallography and Constitution

4-1. **X-Ray Measurement of Order in the Alloy Cu_3Au.** Zigmond W. Wilchinsky. *Journal of Applied Physics*, v. 15, Dec. '44, pp. 806-812.
X-ray diffraction theory is developed for the evaluation of long range order and short range order in the alloy Cu_3Au, and experiments are described whereby each type of order was measured. Values of the long range order parameter S were found to be 0.86 for 250° C, 0.81 for 370° C, and 0.79 for 380° C, the samples being held at elevated temperatures during the X-ray exposures. At the critical temperature $T_c = 388°$ C, S suddenly dropped to zero.

4-2. **Tessellated Stresses, III.** F. Laszlo. *Iron & Steel*, v. 17, Dec. 7, '44, pp. 758-762.
Characteristic stresses; cubic metal crystals; hexagonal metal crystals; surface intersections; crack formation; thermal constants; modification of tessellated stresses; density.

5. POWDER METALLURGY

5-1. **Some Aspects of Powder Metallurgy.** Earle E. Schumacher and Alexander G. Souden. *Bell System Technical Journal*, v. 23, Oct. '44, pp. 422-457.
More common aspects of the powder metallurgy process to acquaint telephone engineers with an increasingly important production method, and to provide an outline of topic references that could otherwise be obtained only from many different sources. 67 ref.

5-2. **Iron in Powder Metallurgy.** R. J. Traill. *Canadian Mining & Metallurgical Bulletin*, no. 392, Dec. '44, pp. 490-500.
Present methods, employing cold pressing and sintering, produce parts that are comparatively poor in mechanical strength. Much hope lies in the succe.sful development of hot pressing methods, whereby mechanical strength can be greatly improved. Aside from desirable physical properties, the iron powder of the future will require to be of high quality and low cost.

5-3. **Powdered Metallurgy.** A. J. Langhammer. *Refrigerating Engineering*, v. 49, Jan. '45, pp. 26-27, 41, 55.
Future possibilities of the art are wide in scope. Manufacture of Oilite self-lubricating bronze bearings from thoroughly mixed metal powders. Economies in time, labor and cost in the manufacture of war materials cited. Significant data on powder metallurgy included in discussion by John Sasso.

5-4. **Powder Metallurgy.** W. I. Pumphrey. *Automobile Engineer*, v. 34, Dec. '44, pp. 547-548.
Some applications of the process in the automobile industry. 3 ref.

5-5. **Physical Properties of Brass Powders.** *Iron Age*, v. 155, Jan. 25, '45, pp. 60-62.

Advantageous properties of brass powder compacts have been overshadowed by the little available knowledge of proper sintering atmospheres. Results on the sintering of 70-30 and 90-10 brass powders indicate that under proper sintering conditions excellent physical properties are obtainable.

6. CORROSION

6-1. **Corrosion of Galvanized Coatings and Zinc by Waters Containing Free Carbon Dioxide.** L. Kenworthy and Myriam D. Smith. *Metallurgia*, v. 31, Nov. '44, pp. 13-18.

Premature failures in galvanized cold and hot water tanks led to an investigation of one of the controlling factors of corrosion of such tanks, the free carbon dioxide content of the water. Conductivity water, a hard public supply water, and a mixture of the two were tested at room temperature, and the hard water was tested also under conditions approximating those in domestic hot water systems. Various carbon dioxide contents were artificially maintained, and both zinc and galvanized mild steel were tested under each condition. (From *Journal* of the Institute of Metals.) 11 ref.

6-2. **Galvanized Coatings and Zinc.** *Chemical Age*, v. 51, Dec. 2, '44, p. 525.

Cold water corrosion; composition recommended.

6-3. **Diagnostic Methods in Problems Concerned with the Corrosion of Cans.** W. B. Adam and D. Dickinson. *Society of Chemical Industry Journal*, v. 63, Dec. 16, '44, pp. 426-428.

Presents a tentative scheme by which causes of hydrogen swells in canned fruits, resulting from corrosion of tinplate containers, may be determined. 3 ref.

6-4. **The Surface Film on Chromium-Nickel 18-8 Stainless Steel.** W. H. J. Vernon, F. Wormwell, and T. J. Nurse. *Metallurgia*, v. 31, Nov. '44, pp. 19-22.

Surface film, stripped from chromium-nickel (18-8) austenitic steel, has been studied and the metals present determined by chemical analysis. (Paper No. 15/1944, of the Corrosion Committee of Iron & Steel Institute, advance copy, Oct. '44.) 11 ref.

6-5. **Current Procedures in Operating So-Called Accelerated Weathering Units.** R. W. Matlack. American Society for Testing Materials *Bulletin*, no. 131, Dec. '44, pp. 34-36.

Results of questionnaire.

6-6. **Stress-Corrosion Cracking of Metals.** *Metal Progress*, v. 47, Jan. '45, pp. 75-78.

Stresses; corrosive environments; prevention; molten metal penetration; electrochemical nature of stress-corrosion cracking; notes on individual metals. (Summary of symposium held by American Society for Testing Materials and American Institute of Mining and Metallurgical Engineers.)

6-7. **Corrosion of Metals by Organic Acids in Hydrocarbon Solvents.** C. F. Prutton, D. R. Frey, D. Turnbull and G. Dlouhy. *Industrial & Engineering Chemistry (Ind. Ed.)*, v. 37, Jan. '45, pp. 90-100.

Presence of oxygen or peroxides is a necessary condition for the corrosion of lead and cadmium by fatty acid solutions in hydrocarbon solvents. Although corrosion in these media will not take place to any large extent in the absence of acids, the rate of corrosion is mainly controlled by the rate of diffusion of oxidizing agent into the metal surface and by the chemical rate of oxidation of the metal rather than by acid strength or concentration. When an insoluble soap film is formed on the metal surface, the rate of corrosion is controlled by the rate of diffusion of the oxidizing agent through the film. Accumulation of lead soaps in solution markedly decreases the rate of corrosion of lead. 7 ref.

6-8. **Internal Corrosion of Tubing in Gas-Condensate Wells Measured by Recording Calipers.** E. H. Short. *Oil & Gas Journal*, v. 43, Jan. 6, '45, pp. 46-47.

Instrument which can be run inside the tubing strings under closed-in pressure to determine the magnitude of corrosion pits.

6-9. **Marine Corrosion.** F. Fancutt and J. C. Hudson. *Iron & Steel*, v. 17, Dec. 7, '44, pp. 780-785.

Anti-corrosive compositions: Effect of pigment and medium.

6-10. **Fretting Corrosion, a Chemical-Mechanical Phenomenon.** Kurt Dies. *(Zeitschrift des V.D.I.*, v. 87, no. 29/30, July '43, pp. 475-476.) *Engineers' Digest* (American Edition), v. 2, Jan. '45, p. 14.

With the object of producing fretting oxides for chemical analysis and to examine their resistance to friction, a simple apparatus was constructed. Test specimens were prepared of various types of steel, tin, zinc, copper, light alloys and a plastic material "T3". Amount of wear occurring was estimated by weight measurements before and after the test. To promote removal of the fretting oxides from between the surfaces, slots were milled in the specimen. Throughout the tests, wear debris was collected in a container which was protected against contamination by oil and dirt.

6-11. **Corrosion Ratings of Metals.** *Steel*, v. 116, Jan. 22, '45, pp. 98, 101, 102, 104.

Because of wide interest in corrosion and its prevention in the immense storage job incident to reconversion, and the importance of corrosion effects in general, data given from Westinghouse Electric and Mfg. Co. are timely.

7. CLEANING AND FINISHING

7-1. **The Siliconizing of Steel.** D. McPherson. *Machinery* (London), v. 65, Nov. 23, '44, pp. 571-573.

Siliconizing or Ihrigizing is a diffusion process which can be included under the group known as solid-vapor systems. Nature of the process; structure and composition of the silicon case; materials treated; physical properties; corrosion resistance; wear resistance; applications of siliconizing.

7-2. **Brush Engineering.** G. O. Rowland. *Iron & Steel Engineer*, v. 21 ,Dec. '44, pp. 90-91.

Developments in industrial power brushes have aided greatly in meeting many production problems. The application of power brushing to modern production has advanced to an exact engineering status.

7-3. **Tests Concerning the Metal and the Preparation of Metal Surfaces for Porcelain Enameling.** W. W. Higgins. American Ceramic Society *Bulletin*, v. 23, Dec. 15, '44, pp. 473-475.

Résumé of information found in the ceramic literature concerning the metal and the preparation of metal surfaces for porcelain enameling. Brief résumés of those tests which seem to be favored in the literature as doing their respective "jobs."

7-4. **Review of Tests for Fineness and Consistency of Enamel Slips.** C. M. Andrews. American Ceramic Society *Bulletin*, v. 23, Dec. 15, '44, pp. 475-477.

Various methods for testing the fineness and consistency of enamel slips are reviewed. These methods are described and compared for their practicability in plant control.

7-5. **Review of the Test Methods Used to Determine Some of the Physical Characteristics of Porcelain Enamels When Applied to Iron and Steel.** F. A. Petersen. American Ceramic Society *Bulletin*, v. 23, Dec. 15, '44, pp. 477-480.

Tests to determine the resistance of an enamel coating to abrasion, impact, and acid attack and tests used to determine the bond between the enamel and metal are discussed.

7-6. **Determination of Thickness of Tin-Lead Alloy Coatings on Copper Wire.** J. W. Price. Society of Chemical Industry *Transactions*, v. 63, Oct. '44, p. 320.

The thickness of tin-lead alloy coatings or tin coatings on copper wire is determined by stripping a weighed sample of measured length in a solution containing nitric acid (d 1.42) 10 ml., urea 15 g., hydrogen peroxide (10-vol.) 10 ml., and water 80 ml. The loss of weight gives the weight of coating.

7-7. **Metal Finishing.** Adolph Bregman. *Iron Age*, v. 155, Jan. 4, '45, pp. 97-99, 180A-180C.

Metal finishing has played an unprecedented role in this war, and most of the progress made has been along the lines of replacement and substitutes for scarce or critical materials. The industry is more than pleased with the very excellent postwar prospects.

7-8. **New Vitreous Enameling Alloy Steel Developed.** *Steel Processing*, v. 30, Dec. '44, pp. 783-784.

Problem of successfully applying white or light pastel cover coat vitreous enamels directly to steel surfaces without the prior application of a base or ground coat enamel has been solved through development of a new vitreous enameling alloy steel known as Inland Ti-Namel steel.

7-9. **Blast Treatment of Metals for Cleaning and Peening.** Edwin Laird Cady. *Metals & Alloys*, v. 20, Dec. '44, pp. 1588-1592.

Reasons for use and the established applications of blast treatments. Provides practical hints for getting the most out of blast equipment and processes.

7-10. **1944 War-Time Metal Finishes.** Harry P. Coats. *Metal Progress*, v. 47, Jan. '45, pp. 102-104.

Metal finishes have been radically changed in nature since the war started, because of the scarcity of certain materials, and because of the desire to obtain dull finishes for products to be used in the combat zone. Lists the more important changes, and describes some of the recent electroplating baths.

7-11. **Shipyard Finds Wide Use for Metallizing Process.** *Steel*, v. 116, Jan. 15, '45, p. 101.

Spraying zinc, copper, brass, and steel speeds production by restoring equipment items to original condition, reclaiming spoiled work and generally cutting time on repairs.

7-12. **Coated Abrasives for Production Surface Finishing.** J. Albin. *Iron Age*, v. 155, Jan. 18, '45, pp. 50-56.

Increased accuracy and greater flexibility are being attained with coated abrasive belts placed on jobs that impose a surface finish requirement with stock removal on a low production cost basis.

7-13. **Finishing Aluminum with Paint Coatings.** Robert I. Wray. *Industrial Finishing*, v. 21, Jan. '45, pp. 66, 69-70, 72, 74, 76.

Primers and various types of protective and decorative coatings that are especially suited to different aluminum products—some coated before, others after fabrication.

7-14. **Product Finishes to Fit Your Postwar Plans.** S. P. Wilson. *Industrial Finishing*, v. 21, Jan. '45, pp. 78, 80, 82, 86, 88.

The protective and decorative coatings used on your postwar products have a great responsibility. Upon them will depend new public acceptance of your products at first and later—particularly later, when many other excellent articles will be offering stiff competition.

7-15. **Hot Aluminizing of Steel** *(La Technique Moderne*, v. 35, no. 21 and 22, Nov. 1 and 15, '43, p. 174). *Engineers' Digest* (American Edition), v. 2, Jan. '45, p. 20.

Aluminizing steel by a hot process by an annealing heat treatment of the steel before coating is done in an artificial atmosphere, the composition and effect of which vary according to the various functions to be carried out during the operation. While passing through this atmosphere the steel is heated and held at the annealing temperature, and is then plunged into a bath of molten aluminum after being cooled, prior to plunging, to a temperature strictly equal to that of the bath.

7-16. **Chromium-Nickel Steel.** W. H. J. Vernon, F. Wormwell, and T. J. Nurse. *Iron & Steel*, v. 17, Dec. 7, '44, pp. 803-806.

Surface film on the 18-8 stainless alloy.

7-17. **Technical Developments of 1944.** Nathaniel Hall and G. B. Hogaboom. *Metal Finishing*, v. 43, Jan. '45, pp. 2-7, 20, 37-38.

Theoretical; anodizing; corrosion prevention; polishing; cleaning and degreasing; abrasive cleaning; pickling coatings; electroforming plating non-conductors; coloring; testing and control. 256 ref.

7-18. **Metallizing Non-Conductors V.** Samuel Wein. *Metal Finishing*, v. 43, Jan. '45, pp. 10-13.

Silver sulphide films; miscellaneous methods; tartrate method; formaldehyde metnods; copper films; hydrazine methods; copper hydride; silver-copper alloys. 25 ref.

7-19. **Fine Finishing—Before and After.** *V.D.I. Zeitschrift*, v. 88, March 4, '44, pp. 121-124.

Excessive fine finishing represents an unnecessary expenditure in manpower and material. An attempt is made to establish (1) how the finishing must be performed, (2) the work period when this finishing should be accomplished, (3) and the limits of the indispensable finishing.

(Continued on Page 5)

Materials Index

THE FOLLOWING tabulation classifies the articles annotated in the A.S.M. Review of Current Metal Literature according to the metal or alloy concerned. The articles are designated by section and number. The section number appears in bold face type and the number of the article in light face.

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The Metals REVIEW
THE MONTHLY SURVEY AND DIGEST OF WHAT'S NEW IN METALS

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Volume XVIII No. 2

Metallurgical Enrollment Needs Encouragement Mahin Tells Indianapolis

Reported by Ralph W. Stahl
District Representative, Lindberg Engineering Co.

E. G. Mahin, head of the Department of Metallurgy, University of Notre Dame, spoke before the Indianapolis Chapter on Jan. 15, on "Training for Careers in Metallurgical Fields." Dr. Mahin pointed out that the study of metallurgy has developed into a vast field whose continued progress calls for the best minds and energy that are available.

He traced the history of the science, which is comparatively new; courses in metallurgy, therefore, have not been so highly standardized as the older sciences. Usually, much more expensive equipment is required. Heads of metallurgical laboratories hold varying ideas as to what equipment it is possible and desirable to purchase, as well as what experimental work should be done in the various courses. For this reason, no single textbook, at least in the more elementary courses, is likely to suit very many teachers. A good reference library is therefore a practical necessity.

While a considerable number of colleges in the United States are giving excellent courses in metallurgy, the enrollment is disappointingly small as compared with that of other engineering departments. Since the field for employment is very large and attractive, it is surprising to note that the highest enrollment in 1941-42 was 2,712 students, while enrollment dropped to 1,070 in Oct. 1943.

Dr. Mahin explained that the Notre Dame Chapter of the American Society for Metals had tried to promote interest in metallurgy by subscribing to METAL PROGRESS for ten high schools in South Bend and neighboring cities. Through questionnaires sent to responsible teachers in these schools, the chapter learned that the subscriptions have become increasingly valuable to the students.

The speaker suggested that decreased enrollment in metallurgical courses might be corrected by individual chapters and members, since industries have a large demand for college-trained metallurgists. He also pointed out that except in recent depression days, there was no year when his university did not receive more requests for graduates than could be supplied. Since educational institutions are not "profit-making," industry itself is, in a way, obliged to give funds to supply adequate equipment and faculty.

Dr. Mahin placed special emphasis on the importance of the ability to speak the English language accurately and to write understandably and correctly.

Cold Reduced Tin Plate Is Ottawa Subject

Reported by E. W. Marshall
Chief Inspector, Ottawa Car and Aircraft, Ltd.

The monthly meeting of the Ottawa Valley Chapter was held on Jan. 9, with Dr. Gordon S. Farnham in the chair. The speaker was W. D. Lamont, of the Dominion Foundries and Steel Co., Hamilton, whose subject was "Cold Reduced Tin Plate". In the discussion period which followed, several very interesting problems were brought out and solutions offered by the speaker. The meeting was opened with an industrial film and lantern slides accompanied the address.

New Haven Advisory-Executive Committee

Members of the combined Advisory and Executive Committees of New Haven Chapter, reading left to right: (Seated) H. G. Keshian, past chairman and past national trustee; A. D. Eplett, past chairman; H. C. Irving, secretary; F. E. Stockwell, chairman; L. A. Ward, vice-chairman; R. M. Brick, treasurer; Harold Fish, past chairman. (Standing) H. R. O'Malley; H. C. Goodwill, past chairman; H. F. DeLacour; S. E. Sinclair; H. L. Bergoff; Haig Solakian; D. F. Sawtelle, past chairman; H. H. Etter; M. J. Weldon; G. L. Richter, past chairman; E. C. Richardson; A. W. Pollard, past chairman; W. H. Macmillan; and J. F. Sargent, past chairman.

Past Chairmen Act as Advisors On Chapter Operations

Reported by P. H. Tomlinson
Farrel-Birmingham Co., Inc.

The New Haven Chapter of the A.S.M. believes it was the first such group to avail itself of the wealth of knowledge and the valuable experience of its past chairmen by forming in 1937 an Advisory Committee composed of all active past chairmen.

All members of this Advisory Committee are invited to all Executive Committee meetings, which are held monthly from September through June, and while only the last two active chairmen have voting privileges, all enter freely into the discussions of the two-hour business meetings.

The Advisory Committee holds meetings at the call of its chairman, who is appointed by the Chapter chairman, to discuss specific problems presented to it by the Executive Committee and to prepare, in writing, constructive recommendations that the members feel would improve Chapter operations.

The accumulated experience of these men which is being given so unselfishly has been invaluable to New Haven Chapter and has contributed in no small degree to the success it has enjoyed.

A.S.M. Nominating Committee

THE CONSTITUTION of the A.S.M. provides that "prior to April 15 of each year the names of the Nominating Committee shall be published by the President for the benefit of the members of the Society in one of the publications of the Society."

Because of the delay in the publication of THE METALS REVIEW, which usually has contained the names of the members of the Committee, the Nominating Committee for 1945 will be listed in the April issue of METAL PROGRESS.

Genius Highlights Officers' Night With Van Horn and Eisenman

Reported by Samuel N. Hunter
Metallurgist, Standard Steel Spring Co.

Genius in abundance, unleashed and rampant, highlighted the Jan. 12th meeting of the St. Louis Chapter, the occasion being National Officers' Night with President Kent R. Van Horn and Secretary W. H. Eisenman in attendance.

Seated at the speaker's table with Dr. Van Horn and Secretary Eisenman were many of the local chapter's most prominent members including Chairman W. A. Peters of the Laclede Steel Co., Vice Chairman Rex DeGhuee, Bethlehem Steel Company, Secretary S. B. Knutson, Standard Steel Spring Co., R. R. Beals, Carondelet Foundry, B. F. Eddie, The Measuregraph Co., George J. Moeller, Dazey Churn & Mfg. Co., Captain R. D. Springer, St. Louis Ordnance District, R. C. Tittle, Owens-Illinois Glass Co.

Chairman Peters introduced the inimitable, beloved and always welcome national secretary. Diverting from mirth provoking quips, Mr. Eisenman gave a resume of the progress of the A.S.M., and forcibly stressed the immediate wartime objectives of the Society: Service to country, service to industry, and service to the membership.

"The Metallurgy of Aluminum Alloys" was the broad subject of Dr. Van Horn's technical address which he covered with a fluency indicative of a profound knowledge of the subject. Literarily and metallurgically, the eminent Doctor's entire presentation was a classic.

Inland Steel Consolidates Metallurgical Activities

Inland Steel Co., Chicago, has established a metallurgical and inspection department by merging the activities of its Indiana Harbor Works metallurgical department, Indiana Harbor Works inspection department, and General Office department of inspection and metallurgy. The purpose of this consolidation is to effect a unified control over all of the metallurgical and inspection services of the company and to obtain more complete correlation of these activities.

J. H. Nead

This new department is headed by J. Hunter Nead as manager. Mr. Nead, who has been with the company for 14 years, has served as chief metallurgist. His principal office is at the Indiana Harbor Works. E. D. Martin and T. S. Washburn are assistant managers, Mr. Martin being located at the Indiana Harbor Works, and Mr. Washburn at the General Office at Chicago.

L. S. Marsh, heretofore manager of the General Office department of inspection and metallurgy, will continue in a special metallurgical advisory and consulting capacity. Mr. Marsh has been with the company for 22 years.

Analogy Drawn Between Air Power And Naval Power; Strategy Similar

Reported by J. N. Lynn
Assistant Metallurgist, Rustless Iron and Steel Corp.

In a talk on "Some Thoughts on the Influence of Air Power on Future History" before the Baltimore Chapter on Jan. 15, E. E. Thum, editor of METAL PROGRESS, drew an analogy between our present outlook with air power and the outlook of Admiral Mahan on naval power in his book, "The Influence of Sea Power Upon History", published in 1889.

In a broad sense the strategy or principles of warfare remain constant, while weapons and tactics vary from war to war. Mr. Thum discussed the points of similarity between the navy and air arm with respect to type of ships, problems of bases and supply, and general strategy. Instances in World War II were cited to substantiate the speaker's statements, although no complete fleet action has yet developed in the air strictly comparable to naval action.

The relative importance of materials research and design was stressed because of its bearing on the tactics of the future, but, with the shrinking of global distances, the need for a well-planned peace is, in his opinion, more important than the development of technology.

Metal Literature Review—*Continued*

7. CLEANING & FINISHING (*Cont.*)

7-20. **Anodizing Racks.** *Aircraft Production*, v. 7, Jan. '45, p. 37.
Simple, employee-designed equipment saves time and material.

7-21. **Survey of Chemical Cleaning Practices for Spot Welding Aluminum Alloys.** F. M. Morris. *Welding Journal*, v. 24, Jan. '45, pp. 61s-64s.
Covers 30 aircraft companies from whom completed questionnaires were received. Vapor degreasers utilizing trichlorethylene as the solvent are used for degreasing heavily soiled parts such as drop hammer parts and parts which are made in mechanical dies where lubricants are used. Seventeen different alkaline types of precleaners are used for removing light oil films, dust and identification ink markings from parts prior to immersion in the oxide remover. Primary function of the precleaners is to remove all foreign matter from the aluminum alloys and to obtain a "chemically" clean surface (one free from water-break) so that the oxide on the aluminum alloy will be uniformly attacked when immersed in the oxide remover. Nine acidic types of oxide removers are used on Alclad 24S-T while two alkaline types are used on bare 24S-T. Average number of spot welds, as reported by the various companies, which were obtained between electrode tip cleaning on the same metal thickness varied considerably for the same oxide remover and also for the different oxide removers.

7-22. **Wider Uses for Castings Through Surface Preparation.** J. H. Shoemaker and H. G. Webster. American Foundrymen's Association *Transactions*, v. 52, March '45, pp. 768-781.
Ferrous metal castings have some limitations which have been removed by the discovery of a new process for the preparation of the casting's surface. Describes actual commercial applications of the process to the following: Gray iron, special processed gray iron, electroplating tin to gray iron, unlike materials, brazing gray iron, special alloy, large castings, bronze to malleable to gray iron, and bronze and brass castings.

8. ELECTROPLATING

8-1. **Plated Plastics—Don't Sell Them Short!** Jeffrey Ames. *Products Finishing*, v. 9, Jan. '45, pp. 28-30.
Plated plastic is considerably lighter than an all-metal object, has improved moisture resistance, and may be protected from many solvents. Part retains all the detail of its easily obtained complex design. Retains its non-conducting properties, is more resistant to heat and vibration and also stronger than an all-plastic article and is not subject to the corrosion that is often encountered due to the electrolytic action between the layers of a metal to metal plating job.

8-2. **Electroplating Facilities Centralized at Republic Plant.** *Automotive Industries*, v. 92, Jan. 15, '45, pp. 30, 32, 116.
Facilities and equipment.

8-3. **The Fundamentals of Chemistry for Electroplaters. XV.** Samuel Glasstone. *Monthly Review*, v. 32, Jan. '45, pp. 19-22.
The preparation and properties of salts.

8-4. **Inspection and Rating of Test Panels Employed in the Outdoor Exposure Tests of Electroplated Coatings.** C. H. Sample. *Monthly Review*, v. 32, Jan. '45, pp. 23-24.
A rating scheme which provides results directly in terms of percentage of the surface failed, stained, or otherwise degraded from its original condition after a given period of exposure is of more practical value to industry than the method employed in the tests under consideration.

8-5. **The Contribution of Electroplating Directly to the War Effort.** Guerin Todd. *Metal Finishing*, v. 43, Jan. '45, pp. 8-9.
Summary of advances and uses.

8-6. **Plating Locomotive and Passenger Equipment Car Parts.** T. R. Boggess. *Metal Finishing*, v. 43, Jan. '45, pp. 14-15.
A pictorial review of electroplating locomotive and passenger equipment car parts, as practiced in the Norfolk and Western Railway Co.'s Shops at Roanoke, Va.

9. PHYSICAL & MECHANICAL TESTING

9-1. **Testing Speed Specifications.** George C. Ernst and LeRoy W. Emley. American Society for Testing Materials *Bulletin* no. 131, Dec. '44, pp. 31-33.
Action of testing machines during test; convenience of application.

9-2. **Fatigue Testing Apparatus.** *Aircraft Engineering*, v. 16, Nov. '44, pp. 334-335.
Fatigue failure may, in practice, result from alternating push-pull, bending or torsional stresses. Testing machines described and illustrations.

9-3. **Resonant Fatigue Tests.** *Western Metals*, v. 2, Dec. 44, pp. 54-56.
New field in fatigue and repeated load tests. Major advantages resulting are simplicity, test data of greater uniformity and value, and substantial savings in time and money in making the necessary setups as well as conducting tests.

9-4. **The Technical Cohesive Strength of Metals in Terms of the Principal Stresses.** D. J. McAdam. *Metals Technology*, v. 11, Dec. '44, pp. 5-31.
Technical cohesive strength of brittle metals; influence of notch angle, notch depth, and root radius on strength and ductility of metals; technical cohesive strength of ductile metals. 12 ref.

9-5. **Hardness Tester With Automatic Certification Stamp.** Adolph Vlcek. *Metal Progress*, v. 47, Jan. '45, p. 95.
To combine the testing and stamping operations into an automatic cycle, a fixture for a standard tester is shown.

9-6. **Fatigue Failures May Be Blamed on You.** H. A. Bolz. *Modern Machine Shop*, v. 17, Jan. '45, pp. 142, 144, 146, 148, 150.
Gives natures and causes of preventives and remedies for fatigue failures.

9-7. **Dependence on Stress of Damping Capacity of Alloys.** Andrew Gemant. *Mechanical Engineering*, v. 67, Jan. '45, pp. 33-38.
Stress dependence of the damping capacity of alloys. 14 ref.

9-8. **Relaxation Methods Applied to Engineering Problems, X. The Graphical Representation of Stress.** D. N. De G. Allen, and R. V. Southwell. *Royal Society Proceedings*, v. 183, Nov. 30, '44, pp. 125-134.
Class of problem having importance in various branches of mathematical physics, and special importance in the theory of elasticity. Its worked examples all relate to the representation of stress, but it has much wider application. 5 ref.

9-9. **Tensile Properties of Longitudinally Welded Plate.** Leon C. Bibber. *Steel*, v. 116, Jan. 15, '45, pp. 80-84, 86, 129-130, 132-133.
Details of tests on full size specimens designed to simulate constructions found in welded steel ships in an effort to learn more about factors involved in cracking and breaking of welded ships. (Presented before the Society of Naval Architects and Marine Engineers.)

9-10. **Fatigue and Tensile Test Specimens Prepared by Grinding.** *Iron Age*, v. 155, Jan. 18, '45, p. 57.
Grinding machines equipped for preparing specimens for use in the laboratory. R. R. Moore standard fatigue specimens have the radius ground on a No. 13 universal and tool grinding machine.

9-11. **Applying Fatigue Test Data in Design.** Joseph Marin. *Machine Design*, v. 17, Jan. '45, pp. 143-146, 200, 202.
Use of fatigue test data in determining the size of members subject to alternating stresses; discusses the interpretation of these fatigue test results and applies these results to the design of machine members. 6 ref.

9-12. **A Note on Bending Beyond the Proportional Limit.** M. Yachter. *Journal of the Aeronautical Sciences*, v. 12, Jan. '45, pp. 21-30, 84.
Following problem solved: Assuming the principle of minimum strain energy to be valid over the entire range of the stress-strain curve, find the exact stress distribution over the depth of a beam in pure bending (or combined bending and axial load, provided strain energy due to axial load and beam column effects are neglected) compatible with equilibrium and minimum strain energy. 2 ref.

9-13. **Mechanical Properties of Magnesium-Alloy Tubing.** R. T. Schwartz and G. M. Martell. *Journal of the Aeronautical Sciences*, v. 12, Jan. '45, pp. 31-38.
Mechanical properties of extruded round, seamless magnesium-alloy tubing, containing 6.55% aluminum, 1.04% zinc and 0.30% manganese, which analysis is similar to that for Dowmetal J and AMC 57S. The tubing was characterized by a low ratio of proportional limit to ultimate strength in tension and a low proportional limit and yield strength in compression compared to those in tension. The tensile and compressive testing presented certain difficulties because of low shear resistance and sensitivity of the material to stress concentration. The marked difference between the stress-tangent modulus data for tension and compression and the correlation of the latter with column properties for knife-edge and flat end conditions are emphasized. Torsional properties were also determined. 7 ref.

9-14. **Fatigue Strength of Butt Welds in Ordinary Bridge Steel—Maximum Stress Compressive.** *Welding Journal*, v. 24, Jan. '45, pp. 7s-9s.
Four groups of tests were planned with stress cycles as follows: (1) Zero to compression; (2) compression to tension one-fourth as great; (3) compression to tension one-half as great; (4) compression to tension three-fourths as great. Three specimens were tested on each of the above cycles with a maximum compressive stress of 32,000 psi. The remaining specimens were tested at the stresses necessary to obtain the data for S-N curves of the various cycles between 100,000 and 2,000,000 cycles. Findings given of greatest interest to designers.

10. ANALYSIS

10-1. **The Volumetric Determination of Aluminum in Magnesium Alloys.** C. H. Wood. Society of Chemical Industry *Transactions*, v. 63, Oct. '44, pp. 317-320.
An alkalimetric titration method has been developed for the determination of aluminum in magnesium alloys. The excess of free acid in a solution of the alloy is neutralized with sodium hydroxide solution using a screened indicator and the aluminum is then determined, using a second indicator, by titration of the equivalent amount of acid liberated by the addition of sodium citrate. The only interfering metal in normal "Elektron" alloys is manganese, but a simple correction can be applied.

10-2. **The Statistical Control of Accuracy in Routine Analyses.** H. G. MacColl. Society of Chemical Industry *Journal*, no. 49, Dec. 9, '44, pp. 418-421.
The principles of quality control which in recent years have proved so useful in controlling repetitive processes in factories can be applied with equal success to the control of accuracy in routine analytical determinations. The methods described are in use in the laboratories of The British Aluminum Co., Ltd.

10-3. **Attack of Refractory Platiniferous Materials by Acid Mixtures at Elevated Temperatures.** Edward Wichers, William G. Schlecht, and Charles L. Gordon. *Journal of Research*, v. 33, Nov. '44, pp. 363-381.
Iridium and other refractory metals and alloys of the platinum group can be easily prepared for analysis, or for small-scale refining, by solution with hydrochloric acid and suitable oxidants in sealed tubes at temperatures up to 300° C. The effects on the rate of solution of iridium caused by variations in temperature, in concentrations of hydrochloric acid and of the oxidant, and in the nature of the oxidant, are reported. The rate increases rapidly with increase in temperature and with increasing concentration of acid.

(Continued on Page 6)

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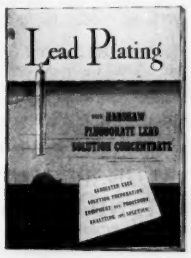

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Metal Literature Review

10. ANALYSIS (*Cont.*)

10-4. The Systematic Detection of Metals on the Small Scale. Christina C. Miller. *Metallurgia*, v. 31, Nov. '44, pp. 39-42.

Application of small scale methods to the systematic qualitative analysis of inorganic substances. Emphasis is laid on the employment of modern sensitive and selective reagents, especially organic substances, for the identification of metals.

10-5. Colorimetric Methods as Applied to the Analysis of Electroplating Baths. D. Gardiner Foulke. *Monthly Review*, v. 32, Jan. '45, pp. 7-10.

Method for the determination of nickel which is rapid, accurate and neat plus quite inexpensive. 4 ref.

10-6. Spectographic Equipment for Foundry Metal Control. H. W. Dietert and John A. Schuh. American Foundrymen's Association *Transactions*, v. 52, March '45, pp. 889-903.

Spectrographic analysis, through years of practical application, has developed into a necessary and profitable method of quick and accurate analysis of foundry metals, enabling analytical control of metal while it is being processed.

10-7. A Combined Method of Chemical Analysis for Cast Iron, Malleable Iron and Steel. Winfield B. Sobers. American Foundrymen's Association *Transactions*, v. 52, March '45, pp. 913-926.

Describes a combined chemical analysis routine for plain and alloyed cast iron, malleable iron and steel. Time saver for completing number of determinations, as well as in the handling and weighing operations of the sample. Less standard equipment and workroom space are needed for this type of analysis, which involves only a short training period.

11. LABORATORY APPARATUS, INSTRUMENTS

11-1. On the Silica Replica Method of Surface Examination with the Electron Microscope. R. F. Baker and F. H. Nicoll. *Journal of Applied Physics*, v. 15, Dec. '44, pp. 803-805.

Making a silica replica by the Heidenreich technique consists in the evaporation of silica in a high vacuum. An alternate method for depositing silica consists in the chemical deposition of silica from the compound $SiCl_4$.

11-2. Harnessing Time and Motion for Industrial Research. H. D. McLarty. *Iron & Steel Engineer*, v. 21, Dec. '44, pp. 70-73.

Ultra high speed photography has proven a valuable tool in many fields of industry, slowing rapid motions to a walk. This new medium is available for the investigation of individual problems.

11-3. Electrolytic Hydrogen Cells of Trail Design. B. P. Sutherland. *Canadian Chemistry & Process Industries*, v. 28, Dec. '44, pp. 812-814, 821.

Design details of a robust "streamlined" low cost cell suitable for continuous duty with minimum maintenance.

11-4. Comprehensive Exposure Chart for Micrography. Anton L. Schaeffler. *Metal Progress*, v. 47, Jan. '45, p. 96.

Chart covering the entire range of standard magnifications.

11-5. New Method of Mounting Metallographic Specimens. Ulric J. Hochschild. *Metals & Alloys*, v. 20, Dec. '44, pp. 1614-1615.

Metallographic microscope is the basic tool for quality control of metal-working processes involving changes in the structure of the material. More efficient metallographic inspection is the chief aim and outcome of the new method of mounting microspecimens.

11-6. A Contact Extensometer for the Determination of Operating Stresses. A. Thum and O. Svenson. *V.D.I. Zeitschrift*, v. 88, March 18, '44, pp. 153-154.

Extensometer described and its application explained.

11-7. X-Ray Diffraction. A. R. Weill. *Iron & Steel*, v. 17, Dec. 7, '44, pp. 741-749.

Applications in the study of metals and alloys: Identification; quantitative analysis; stress measurement.

11-8. Problems Concerning the Microchemical Balance, Part I. Cecil L. Wilson. *Metallurgia*, v. 31, Dec. '44, pp. 101-102.

Precautions to be taken when installing a microchemical balance. The more important of these are considered, and it is shown that in the majority of cases serious expense or extensive structural alterations are not to be anticipated.

12. INSPECTION AND STANDARDIZATION

12-1. A.I.D. Inspection in Aluminum Foundries. E. Carrington. *Light Metals*, v. 7, Dec. '44, pp. 570-581.

Aims and practice of A.I.D. inspection for light alloy castings, and briefly outlines the established system for the development of official specifications.

12-2. Symposium on Magnetic Particle Testing. American Society for Testing Materials *Bulletin* no. 131, Dec. '44, pp. 7-16.

Equipment for Magnetic Particle Inspection, by A. V. deForest and C. E. Betz; Magnetic Particle Inspection, Particularly From the Standpoint of Specification Requirements, by H. H. Lester; Magnetic Particle Inspection of Aircraft Parts, by E. O. Dixon; The Magnetic Particle Test as Utilized by the Railroads, by L. B. Jones; Specifications and Procedures, by A. F. Spooner; Magnetic Powder Inspection of Castings, by Clyde L. Frear; Magnetic Particle Inspection of Forgings, by Clarence J. Boyle; Miscellaneous Applications of the Magnetic Particle Test, by E. A. Snader.

12-3. Uniform X-Ray Exposures. H. D. Moreland. *Steel*, v. 116, Jan. 8, '45, pp. 98, 100, 132.

Automatic photoelectric X-ray exposure control consists of two units—the photo-tube camera which measures amount of radiation that strikes the negative, and the assembly containing safety timer and power supply.

(Continued on Page 8)

Nine Hartford Experts Answer Questions on Cold Treatment, NE Steels, and Magnafluxing

Reported by E. A. Verrillo
The Henry Souther Engineering Co.

Members of the Hartford Chapter of the A.S.M. were treated to an instructive and highly entertaining "Information Please" program at the January meeting. A panel of nine local metallurgical "experts" selected from diverse fields of manufacturing were exposed to a fusillade of questions ranging from the psychological to the physical—from "Why can't a metallurgist answer 'Yes' or 'No'" to "Why is austenite non-magnetic?" However, most of the questions and subsequent discussions were confined to practical aspects of present-day metallurgical practice.

The meeting was opened with a shower of silver dollars produced from various pockets by Technical Chairman A. H. d'Arcambal and presented as prizes on a "heads I lose, tails you win" condition to the experts who answered satisfactorily or the questioner who remained perplexed.

Cold treatment—usually a heat producer when two or more steel treaters meet—received cool treatment from several of the experts whose opinions were based on practical experience. Exceptions were made in applications where size stabilization was a prime consideration or where extreme sluggishness of air cooling steels required sub-zero treatment to attain maximum hardness.

Speculation concerning the retention of some NE steels as part of the S.A.E. series centered on the 8600 and 8700 series, the consensus being that the future trend was toward the triple alloy type and away from the single alloy steels, for reasons of necessity and economy (utilization of tramp alloys in scrap) and the increased importance of specified hardenability rather than chemistry.

The question of recent high rejections resulting from magnafluxing soon expanded itself into the broader aspects of inspection and led to the inevitable conclusion that 100% rejections would result from the over-refinement of inspection methods. It was generally agreed that the only conclusive proofs of serviceability are service record and past experience.

Portable Products Acquires Tagliabue Co.

The C. J. Tagliabue Mfg. Co., Brooklyn, N. Y., manufacturers of industrial control and laboratory instruments, has sold its assets, including good will, name and patents, to the Portable Products Corp. of Pittsburgh, Pa. The business will be operated as a separate division of the Portable Products Corp.

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Shot Peening, Case Hardening Counteract Stress Raisers

Reported by J. E. Mitchell
Prest-O-Lite Co., Inc.

J. O. Almen, head of mechanical engineering department, General Motors Research Laboratories, in his talk before the Indianapolis Chapter on Dec. 18, expounded three principal themes, namely: That service failures of parts due to fatigue are the result of tension in the surface layers and are never due to compression; that the metallurgist's tools, consisting of the microscope, the tensile tester and indentation hardness tester, give misleading information as to the true results to be expected of a highly stressed member; and that the best method of counteracting stress raisers in the surface is to introduce compressive stresses by such methods as shot peening, case hardening and combinations of the two.

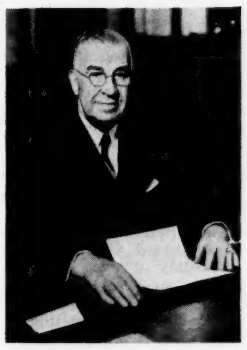
Mr. Almen's talk was profusely illustrated with lantern slides and actual demonstrations. He illustrated the advantages of a carburized surface compared to nitrided, induction hardened and shot peened surfaces of various types.

Induction hardened equipment to be used on highly stressed parts must be selected with care, he said, and time and money may be wasted in polishing aircraft parts all over when shot peening of non-wearing surfaces would increase their life many times.

Death Ends 52-Year Career In Pittsburgh Steel Industry

Long a prominent leader in the nation's steel industry, C. W. Heppenstall, chairman of the board of Heppenstall Co., Pittsburgh, died Monday, Jan. 15, at the age of 72.

For nearly 52 years, Mr. Heppenstall was associated with the company which bears his name, and was chiefly responsible for its growth. Starting with the concern as office boy, and later a worker in the plant, he had been since 1898 successively superintendent, general manager, president and board chairman.



C. W. Heppenstall

Known for many years as an eminent figure in the steel forgings industry, Mr. Heppenstall was widely credited with successful pioneering in the development of equipment and processes now generally adopted within this industry.

He was a member of the American Society for Metals, the American Iron and Steel Institute, British Iron and Steel Institute, American Institute of Mining and Metallurgical Engineers, Engineers Society of Western Pennsylvania, and Army Ordnance Association.

Frank L. Gibbons

Frank L. Gibbons, manager of sales, alloy division, Carnegie-Illinois Steel Corp., Chicago, who died Friday, Jan. 19, had been associated with Carnegie-Illinois since 1936. Previously he had been vice-president of the Timken Roller Bearing Co., in Canton, Ohio, and before that with Republic Steel Corp., in Cleveland and others in Detroit and Pittsburgh. He was 53 years of age and was educated at Carnegie Institute of Technology.

President Van Horn Shows Curves Both Scientific and Pleasing at Chicago

Reported by Lawrence Jacobsmeyer
Technician and General Manager, Salkover Metal Processing

The national president and the national secretary of the Society were honored by 225 members of the Chicago Chapter on Jan. 11.

A film produced by the United States Secret Service entitled "Know Your Money" opened the meeting, after which Bill Eisenman told a few of his famous stories.

The subject of Dr. Van Horn's technical discussion was "The Metallurgy of the Aluminum Alloys." The various slides showed some very interesting curves not generally found in technical discussions; however, the consensus of the members was that although some of these curves were not very scientific, they were certainly pleasing to the eye.

Choice of Brasses Based on Strength Vs. Drawing Properties

Reported by J. L. Petz
International Business Machines Corp.

The various copper alloys were compared with respect to their properties and characteristics in deep drawing by L. E. Gibbs, technical advisor, Rome Division, Revere Copper and Brass, Inc. at the Dec. 11th meeting of the Rochester Chapter.

He pointed out the necessity of choosing between high copper alloys with relatively low strength and low work hardening rates as against cartridge brasses with high strength but which generally require intermediate annealing between draws. Among the problems in deep drawing which Mr. Gibbs discussed were the following:

1. Low physical properties—caused by insufficient cold working or too large grain sizes prior to cold working.
2. Wall breakage in tubular shaped articles—caused by too heavy reductions or cold working beyond the ability of the metal to deform.
3. Pushing out the bottom of a cup or similar shaped article—caused by poor surfaces due to etching by pickling solution, improper cleaning, or rough tools.
4. Thinning of metal at the bottom of cup-shaped pieces—caused by end of punch being too smooth or by improper control of gage of metal.
5. Scratches, laps, or other defects on the walls of pieces—caused by tools that are dirty or have picked up metal.

Mr. Gibbs also discussed the importance of using the proper lubricant, but cautioned that lubricants must be thoroughly washed off before annealing.

In a consideration of the question of stress corrosion or season cracking in alloys with less than 85% copper, Mr. Gibbs stated that relief annealing between 400 and 600° F. should relieve stresses sufficiently to avoid season cracking; but that for mill shapes, such as rods, the stresses may be removed by straightening machines rather than by relief annealing.

Induction Heat, Refrigeration Other New Practices Described

Reported by G. H. Taylor
Chief Inspector, La Plant-Choate Mfg. Co., Inc.

R. B. Seger, works manager, Lindberg Steel Treating Co., described the newer practices used in heat treating steel and their practical application before the new Cedar Rapids Chapter of the A.S.M., on Jan. 9.

The wider use of isothermal transformation principles to improve hardening techniques, using molten salt baths for quenching, was advocated. Austempering and martempering were differentiated and their applications and use described.

The spotlight was next put on high frequency and megacycle induction heating. Motor-generator sets, spark-gap converters, and electronic heaters were briefly described and the classes of work, which overlap in many cases, best suited for each type of power source discussed. Mr. Seger stated that although commercial heat treaters seldom have the production usually thought necessary to install induction heating units, it performs certain jobs so much better than the more conventional methods of heating, that it is now firmly established for commercial heat treating.

Super-cooling or refrigeration of tool, die, and related steels was given considerable attention by Mr. Seger. He advocated that refrigeration of all steels of this type be included as a part of their heat treatment to improve their stability and life.

The technical meeting was preceded by showing the color sound motion picture "Heat Treating Hints".

New York Univ. Offers Evening Courses On Powder Metallurgy, Lab. Management

"Powder Metallurgy" and "Research Laboratory Management and Development" are the subjects of two of the evening courses being offered by the Graduate Division, College of Engineering, New York University, during the spring term.

The course on powder metallurgy meets on Tuesday from 7 to 10 p.m., with a laboratory session on Friday evenings. It is conducted by Professor Fair and Dr. Goetzel of the Department of Chemical Engineering. The research laboratory course meets on Monday evenings from 8 to 10 p.m., and is presented by a distinguished group of directors of research from industry.

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A.S.M. Review of Current Metal Literature— *Continued*

12. INSPECTION AND STANDARDIZATION (*cont.*)

12-4. **Conferences on United States, Canadian and British Standards for Screw Threads.** *Machinery* (London), v. 65, Nov. 30, '44, pp. 611-614.

American delegates proposed the adoption of the truncated form of Whitworth thread. Desirability of devising a common standard for screw threads, both as regards the form of the thread and the commonly used series of diameters and their related pitches.

12-5. **Gage Control Assures Aircraft Pipe Thread Accuracy.** E. R. Hudson. *Tool Engineer*, v. 15, Jan. '45, pp. 73-76.

Carburetor manufacturer develops method to check points on gages where wear occurs most frequently. Simple, practical, and accurate method eliminates "human element" and is widely applicable.

12-6. **Simple Tool Inspection Method.** D. P. Walsh. *Tool Engineer*, v. 15, Jan. '45, pp. 89-91.

Application of commercial "black light" method to inspection of all types of cutting tools seems particularly helpful to carbide tool users and producers. Rapid analysis can aid in locating sources of trouble in tool manufacture and grinding.

12-7. **Precision Measurement of Balls for Instrument Bearings.** W. H. Meiklejohn. *Machinery*, v. 51, Jan. '45, pp. 147-151.

Measuring instruments of extreme accuracy must be used to insure readings in millionths of an inch.

12-8. **Checking Aircraft Assembling Jigs by Optical-Mechanical Means.** *Machinery*, v. 51, Jan. '45, pp. 171-176.

Checking of alignment and linear dimensions by means of optical equipment and micrometer trammels.

12-9. **Simple Gage for Checking Pump Gears.** B. T. Smith. *Machinery*, v. 51, Jan. '45, p. 177.

Gage for checking pump gears for thickness of tooth section, major diameter of gear, and concentricity.

12-10. **Metallurgical Control of Forging.** A. J. Pepin. *Steel*, v. 116, Jan. 15, '45, pp. 76-77, 88, 90, 92.

Important factors in controlling quality of aircraft forgings. Chemical analysis as guide in specifying should not be minimized.

12-11. **Casting Eight Inches Thick Examined in Three and One-Half Minutes by Two-Million Volt X-Ray Unit.** *Steel*, v. 116, Jan. 15, '45, pp. 95, 120.

78 times as fast as the million-volt machine. The new unit is mobile. Employs a multiple-electrode tube in which the electrons, starting from a heated filament at the top, are speeded in stages until they have the total rated energy.

12-12. **Better Battleships With X-Rays.** John L. Bach. *Welding Engineer*, v. 30, Jan. '45, pp. 38-39.

Speeding the day of our final reckoning with Tokio, X-ray inspection assures perfect welds and castings for our fighting ships and helps navy yards to send superb new naval units to sea in record-breaking time.

12-13. **New X-Ray Technique Introduced.** *Aero Digest*, v. 48, Jan. 1, '45, pp. 112, 229.

New technique is that of photographing on 35-mm. film objects projected on the fluorescent screen, a process known as photo-fluorography.

12-14. **Some Aspects of Casting Inspection as Seen by a Purchasing Agent.** R. V. Elms. American Foundrymen's Association *Transactions*, v. 52, March '45, pp. 750-757.

Outlines the procedure followed by respective company to obtain full agreement between themselves, as the buyer and the producer of the castings. Points out the responsibilities of the buyer as well as the vendor. Shows the need in the foundry for an inspection department with adequate facilities. Inspection departments, although non-productive, many times prove to be invaluable in detecting errors before too many scrap castings are produced.

12-15. **Standards in Times of Emergency.** Phil Carroll, Jr. American Foundrymen's Association *Transactions*, v. 52, March '45, pp. 945-959.

What is speed? Compromises are injurious; manpower; essentials of progress; training; effective time study methods; time study simplified; rate setting deficiencies; approach to data; data save time; standard setting; explaining standards; application of data methods; set-up standards; delay time; product vs. department measure; supervisory help; total effectiveness.

13. TEMPERATURE MEASUREMENT AND CONTROL (PYROMETRY)

13-1. **Temperature Impulse as a Means for Furnace Control.** C. Sieber. *Metall Wirtschaft*, v. 22, nos. 27/29, Aug. 20, '43, pp. 405-411.

The term "temperature impulse" is used to define the action of the primary measuring element in a temperature control circuit, under influence of changes in furnace temperature. Various types of primary temperature measuring elements are discussed with respect to their responsiveness, sensitivity, accuracy, and construction.

13-2. **Contact Thermometers.** *Chemical Age*, v. 51, Dec. 9, '44, pp. 545-546.

The adjustable contact thermometer will control temperatures at various points. It is provided with two scales—the upper one for adjusting and setting the movable index to any temperature desired, the lower one for measuring temperature. Adjustment is made by means of a magnet sliding over the thermometer which at the same time holds the index in position once it has been set to the desired temperature.

13-3. **Fuel Economy.** *Iron & Steel*, v. 17, Dec. '44, p. 721.

Temperature control of heating and process steam.

14. FOUNDRY PRACTICE AND APPLIANCES

14-1. **The Development and Production of Inoculated Cast Iron.** H. P. Hughes and W. Spenceley. *Engineering*, v. 158, Dec. 8, '44, pp. 458-459.

The materials used previous to inoculation were a high phosphorus iron, two grades of low phosphorus iron (about 0.3 to 0.4% phosphorus), good-quality machinery scrap and return scrap. Similar irons were used after the adoption of the inoculation procedure, but the machinery scrap was replaced by steel scrap, so that a carbon content of between 3.2 and 3.3% should be obtained. No special pig-irons were used throughout this investigation. The corresponding analyses are shown. The comparative figures of 15 tests are given. (Paper presented at the 41st annual meeting of the Institute of British Foundrymen, Manchester, June 10, '44.)

14-2. **Wartime Developments in Whiteheart Malleable Iron.** G. R. Webster. *Engineering*, v. 158, Dec. 15, '44, pp. 477-480.

Foundry problems in the production of whiteheart malleable. (Presented at the 41st annual meeting of the Institute of British Foundrymen, held at Manchester, June 10, '44.)

14-3. **Automobile Castings.** J. B. Duncan. *Iron & Steel*, v. 17, Dec. '44, pp. 709-713.

Range of irons used in a large foundry for parts such as camshafts and crankshafts and the control necessary for their successful production.

14-4. **Some General Aspects of Continuous Casting.** V. Kondic. *Metallurgia*, v. 31, Nov. '44, pp. 7-9.

Continuous casting has been known and practiced for a century or more, but it is only during recent years that rapid progress has been made in its development. Today, commercial technique has been developed to permit one of many processes to be applied to a wide range of ferrous and non-ferrous metals and it is probable that further advances in technique will soon be made. Some general aspects are given in the application of continuous casting in the production of ingots or billets.

14-5. **Speed of Rotation in the Centrifugal Casting Process.** J. E. Hurst. *Foundry Trade Journal*, v. 74, Nov. 23, '44, pp. 233-236, 245.

Discussion on a paper presented at the annual conference of the Institute of British Foundrymen. Influence of vibration; weight of gear blank; more efficient thermal contact; apparent inconsistencies; theoretical calculations; "semi-centrifugal casting."

14-6. **The Mechanized Production of Aluminum Gravity Die Castings for the Merlin Engine.** John Vickers. *Foundry Trade Journal*, v. 74, Nov. 23, '44, pp. 237-244.

Resumé of production methods used is given in this installment.

14-7. **Light-Metal Permanent-Mold Castings.** L. F. Swoboda. *Iron Age*, v. 154, Dec. 28, '44, pp. 56-58.

Advantages afforded by the combination of the permanent-mold process and the light metal alloys promise wide-spread utilization for postwar products. (Abstract of paper presented before S.A.E. in Los Angeles.)

14-8. **The Mechanized Production of Aluminum Gravity Die Castings for the Merlin Engine.** John Vickers. *Foundry Trade Journal*, v. 74, Dec. 7, '44, pp. 277-283.

Advantages of gravity die casting over sand castings.

14-9. **Improvements in Static Ferrous Castings Influencing Their Future Use.** G. Vennerholm. *American Foundryman*, v. 7, Jan. '45, pp. 2-9.

Recent developments and improvements relating to static ferrous castings, which should have a beneficial effect upon their future use as an engineering material. 13 ref.

14-10. **Design Proportions Affecting Qualities of Castings.** J. A. Wettergreen. *Product Engineering*, v. 16, Jan. '45, pp. 27-31.

Design rules that help in the production of satisfactory castings and in the reduction of foundry costs. Original designs and redesigns are described to show that many production difficulties can be avoided both in making and in finishing the casting by understanding the variables in foundry technique and operations. 13 ref.

14-11. **Sealants for Metal Castings for Varying Degrees of Porosity.** R. W. Crawford and Sanford E. Glick. *Product Engineering*, v. 16, Jan. '45, pp. 53-55.

Materials and impregnation methods for various metals are discussed on the basis of requirements of a satisfactory sealant. The article gives details of a new synthetic resin-styrene copolymer solution that has high efficiency for sealing porosity in magnesium castings.

14-12. **Propane Torch for Sand Mold Drying.** *Western Metals*, v. 2, Dec. '44, p. 21.

Development of a new type of torch for green sand mold drying. Uses for its fuel propane gas.

14-13. **The Mechanized Production of Aluminum Gravity Die Castings for the Merlin Engine.** John Vickers. *Foundry Trade Journal*, v. 74, Dec. 14, '44, pp. 299-303, 307.

Advantages of gravity die casting over sand castings.

14-14. **Modern Impregnating of Magnesium Castings.** Harold A. Knight. *Metals & Alloys*, v. 20, Dec. '44, pp. 1625-1630.

Treatment of magnesium alloy castings to plug up their pores and make them pressure-tight. A number of impregnating agents and treatments are now available, and this article compares them generally and describes more specifically the applications and service performance of one recently developed synthetic product.

14-15. **Sandslinger Molding Practice.** *Iron Age*, v. 155, Jan. 11, '45, pp. 46-49, 122, 124, 126, 130, 132, 134, 136, 138, 140.

Sandslinger method of ramming mold boxes offers many advantages to the jobbing foundry. Gives uniform mold surfaces, better permeability for equal mold hardness and improved parting than other methods. Savings in manhours by the use of this mechanical device are considerable. British practice in its use, its application to specific patterns and an evaluation of its advantages when compared with hand, jolt and squeeze methods of ramming are described.

14-16. **Light-Metal Permanent Mold Castings.** L. F. Swoboda. *Foundry*, v. 73, Jan. '45, pp. 72-74, 176, 180, 182, 184.

Advantages and characteristics of aluminum and magnesium castings made by the permanent mold process. (Presented before the National Aeronautic Meeting of the Society of Automotive Engineers at Los Angeles.)

14-17. **Mechanization Aids Good Housekeeping.** Lester B. Knight. *Foundry*, v. 73, Jan. '45, pp. 76-78, 156.

Use of mechanical equipment does not guarantee a clean, orderly shop but it will help achieve it. Units which promote good housekeeping described. (Presented before the annual meeting of the Gray Iron Founders' Society at Cincinnati.)

14-18. **Women Prove Capable as Bench Molders.** *Foundry*, v. 73, Jan. '45, pp. 79, 173-174.

Experience at the foundry of the Saco-Lowell Shops, Biddeford, Me.

14-19. **Selecting Inhibitors for Magnesium Molding Sand.** L. W. Eastwood. *Foundry*, v. 73, Jan. '45, pp. 80-81, 208, 210, 212.

Types of inhibitors and their advantages and disadvantages described.

14-20. **Patterns for Propellers.** Herbert J. McCaslin. *Foundry*, v. 73, Jan. '45, pp. 82-84, 214, 216, 218.

In building standard type propeller blade patterns two methods of laminated construction usually employed. Difference in the two procedures lies in the thickness and the shape of the layers of the wood and the direction of the grain.

14-21. **Repairing Defective Automotive Gray Iron Castings.** *Foundry*, v. 73, Jan. '45, pp. 86, 160, 162, 164, 168, 170.

Gas and arc welding; nickel welding (so-called "cold welding"); general nickel welding; special repair conditions.

14-22. **Improvements in Pressure Ferrous Castings Influencing Their Future Use.** E. C. Jeter. *SAE Journal*, v. 53, Jan. '45, pp. 19-24.

Development and improvements of the centrifugal casting field, and particularly the improvements in steel centrifugal castings in the past several years. Describes briefly the air-pressure casting method. 6 ref.

14-23. **The Accelerated Cooling of Cast Steels.** J. M. Dugan and G. D. Griffiths. *Iron & Steel Engineer*, v. 22, Jan. '45, pp. 68-78.

Effects of rapid chilling of cast steel and presents a method of attaining these results in the manufacture of cast steel rolls.

14-24. **Side Feeding.** B. Gray. *Iron & Steel*, v. 17, Dec. 7, '44, pp. 755-758.

Influence of the mechanism of freezing on steel castings.

14-25. **Core Binders.** W. Davies and W. J. Rees. *Iron & Steel*, v. 17 Dec. 7, '44, pp. 763-766.

Bonding properties of petroleum extracts and of extract and linseed oil mixtures.

14-26. **Side-Blown Converters.** P. S. Fassotte. *Iron & Steel*, v. 17, Dec. 7, '44, pp. 767-770.

Developments in the design and use of foundry plants.

14-27. **Synthetic Moulding Sands.** W. Davies and W. J. Rees. *Iron & Steel*, v. 17, Dec. 7, '44, pp. 774-779.

Study of grain shape in relation to properties.

14-28. **Steel Castings.** H. T. Protheroe. *Iron & Steel*, v. 17, Dec. 7, '44, pp. 794-798.

Influence of melting conditions on physical properties.

14-29. **The Production and Founding of Inoculated High-Duty Cast Iron.** J. L. Francis. *Foundry Trade Journal*, v. 74, Dec. 28, '44, pp. 335-341.

Cooperation of the designing, pattern-making, founding and metallurgical departments. 8 ref.

14-30. **Centrifugal Casting of Gears. El.** *V.D.I. Zeitschrift*, v. 88, Feb. 19, '44, p. 100.

The process of centrifugal casting is described. Cast steel gears produced by this method have the same strength properties as forged gears.

14-31. **Rub-a-Dub-Dub—Few Men for the Tub.** G. K. Lewis. *Die Casting*, v. 3, Jan. '45, pp. 26-27, 33.

Since different machines require motors ranging in power from one-third to three horse power, provision had to be made for different sized bases on the same type of casting. This is accomplished by interchangeable cores.

14-32. **Precision Casting—Its Place in Design.** S. O. Fisher and E. E. George. *Machine Design*, v. 17, Jan. '45, pp. 123-126.

Potentialities of precision casting for future applications may be listed as follows: Manufacture of parts from alloys which cannot be mechanically worked either hot or cold; manufacture of parts from alloys which are difficult to forge, fabricate or machine; manufacture of intricate shapes which cannot be made by any other method; manufacture of limited quantities of materials ordinarily made by screw machine or die casting but where the number to be made does not justify a screw-machine setup or the cost of a die-casting die.

14-33. **Gating and Feeding Malleable Pipe Fittings.** Morris L. Hawkins. American Foundrymen's Association *Transactions*, v. 52, March '45, pp. 593-603.

Detailed description of the foundry practices for production of sand-cast malleable iron pipe fittings; careful selection of patterns and methods of gating, followed by a thorough inspection of trial castings; permanent gating arrangement for patterns mounted on a single match plate illustrated.

14-34. **Heading and Gating of Malleable Iron Castings.** A. J. Klimek. American Foundrymen's Association *Transactions*, v. 52, March '45, pp. 604-611.

Foundry practice; sprues; strainer cores; headers; heat concentration; metal turbulence.

14-35. **Gating and Heading.** C. C. Lawson. American Foundrymen's Association *Transactions*, v. 52, March '45, pp. 612-622.

Many points are to be considered before gating a pattern if success is to be attained. Success in this field remains the exclusive property of the skilled practical man. Pattern design; shrinkage; dendrites and cracks; time wasted; loose patterns; gating; cold iron; elimination of slag and dirt; skim cores; added fillets.

(Continued on Page 10)

Centrifugal Castings May Be of Two Types

Reported by E. M. Evans
MacDonald Bros. Aircraft, Ltd.

Two distinct types of centrifugal castings were discussed by John Perkins, assistant foundry superintendent of the Ford Motor Co. of Canada, Windsor, Ont., before the Manitoba Chapter on Dec. 14.

The first type is the usual method where the metal is poured into a rapidly rotating cylindrical mold and solidifies against the wall of the mold to form a hollow cylinder. The wall thickness of the cylinder is controlled by the amount of metal poured into the mold. This method is, of course, only suitable for hollow cylindrical castings such as aircraft cylinders.

The second type of casting technique described is the centrifuge method. In this process the molds are arranged on a rotating table around the periphery of a central sprue. The metal is poured through the sprue and travels radially outwards through suitable gates to the molds. Almost any style casting may be produced by this method.

Dry sand, permanent mold, and green sand molds may be used and all types of metals have been successfully cast in this manner. One of the outstanding achievements of this method is the utilization of scrap tool steel. Several milling cutters, hobs and reamers of 18-4-1 high speed steel were shown which had been successfully cast from re-melted scrap. The cutters are cast to shape and it is only necessary to grind the cutting edges and the hole or shank in the case of milling cutters.

Considerable experimental work on the possibilities and limitations of this type of casting is now being carried out. One of the most important advantages of centrifugal casting technique is the high "yield" which may be obtained by the elimination of risers, heavy sprues and gates.

Following the dinner, an illustrated coffee talk was given by Fred Lillich, Jr., Jacobs Engine Works representative for Western Canada, on the beauties of Western Canada.

Aluminum Alloys Improved By Anodizing and Dye Coloring

Reported by Don Sener
Assistant to Special Representative, Harrisburg Steel Corp.

The Colonial Alloys Co., of Philadelphia, Technical Process Division, presented Messrs. Edward Engel and C. Cohn as speakers for the December meeting of the York Chapter, discussing "Anodizing and Dye Coloring of Aluminum".

A layman's understanding of the properties of aluminum will suffice to make one appreciate the benefits gained from anodizing. By its use the abrasion resistance of aluminum is greatly increased, conduction of electricity is reduced to nil, and the finish of the product can be further beautified in conjunction with the use of various dyes. The colors which can be imparted vary the length of the spectrum both in shade and density.

The process of anodizing aluminum is comparatively simple from a chemical viewpoint, for it entails merely the changing of a thin outer layer of the aluminum to alumina. To meet the competitive field of a free market, manufacturers have gone a step further by adding color to the finish. This color is applied after anodizing by dipping the piece in a hot dye solution for a period of 2 to 10 min. The dye stains the oxide coating and assumes the same properties, although the color has a tendency to fade under continuous exposure to sunlight.

This process of anodizing and dye coloring of aluminum will find even greater post-war use in costume jewelry and other decorative pieces, Mr. Engel predicted. Another use depends upon the ability of the dyes to withstand high temperatures such as in sterilization; instruments may therefore be so treated.

Dr. Cohn's part of the program was devoted to plating and included the difficulties encountered and how they are solved. He supplemented his remarks by a practical demonstration of the plating of aluminum with copper.

Hubbard Leaves Boeing for Minneapolis Firm

A. W. Hubbard, formerly supervisor, manufacture training and coordination, Boeing Aircraft Co., Wichita Division, has transferred to Minneapolis as technical director for Electric Machinery Mfg. Co. Mr. Hubbard was the first chairman of the Wichita Chapter of the American Society for Metals when it was formed in January 1943.

Payson Talks on Cycle Annealing

Reported by John R. Dobie
Heat Treat Foreman, American Steel and Wire Co.

Rudolph A. Johnson (left) of Wickwire-Spencer Steel Co., chairman of Worcester Chapter, A.S.M., presided at the December meeting; Albert Palmer, vice-president and director of engineering, Crompton & Knowles Loom Works, Worcester, reviewed in detail development of his company through the formative years of the city's industrial life; Peter Payson, assistant research director, Crucible Steel Co. of America, and recognized authority on cycle annealing, spoke on "The use of S-Curves in Production Heat Treatment," and George H. Campbell, of Pratt and Inman, Worcester (right), secretary-treasurer of the Chapter, was host to Mr. Payson during the latter's stay in the city. Mr. Payson's talk has been reviewed when presented before other chapters.

Mild Alloy Steels, Stainless And Aluminum Evaluated

Reported by Frank P. Kristufek
U. S. Steel Corp. Research Laboratory

Alloys for high strength, light weight construction were discussed at a panel meeting of the New Jersey Chapter A.S.M., on Nov. 20. Led by technical chairman Willard L. Hults, the session featured three speakers: Frederick D. Foote, president, Alloys Development Corp.; Stanley P. Watkins, manager, development division, Rustless Iron and Steel Corp., and H. N. Hill, assistant chief engineer, design division, Aluminum Co. of America.

All of the talks centered on the field of transportation as being the most important in which light weight, high strength alloys are utilized at present.

According to Mr. Foote, mild alloy steels were developed primarily for the transportation field to fill the need for an economical, high strength alloy. Such steels need not be heat treated after forming; their greatest application at present is in light weight freight cars.

The primary advantages of stainless steels, as enumerated by Mr. Watkins with the aid of slides, are their corrosion resistance, heat resistance, and welding properties. The most desirable properties of stainless steels are obtained as a result of cold forming; however, extremely heavy forming equipment is necessary and wear on dies is great.

Mr. Hill pointed out that aluminum alloys were used extensively in transportation prior to the war because of their light weight and high yield and tensile strength. Among the numerous advantages of aluminum alloys are their toughness and resistance to fatigue and corrosion. They can be formed with standard equipment, can be machined easily and at high speeds, and can be welded and soldered.

V. N. Krivobok, who led the general discussion following the talks, agreed with the speakers in expressing the opinion that utilization of one or another of the alloys mentioned is very definitely decided by the use to which it is to be put.

Methods of Making Metal Powders And Forming Into Products Shown

Reported by T. E. Hamilton
Delco Products Div., General Motors Corp.

Fritz V. Lenel, metallurgist, Moraine Products Division of General Motors Corp., Dayton, Ohio, addressed the January meeting of the Dayton Chapter on "Powder Metallurgy." Dr. Lenel discussed the history of metal powders beginning with platinum and tungsten, and named four important methods for making metal powders, namely, by grinding, atomizing, electrolytic, and oxide reduction.

He then discussed the forming of these powders into various products. The talk was illustrated by a number of slides showing processing steps and the powder metal structure.

Grain Refinement by Forging Is Important Attribute of Process

Reported by F. G. Wayman
Chemist, The Steel Co. of Canada, Ltd.

"To make a steel forging is to produce an article in which the direction of grain flow is oriented so as to develop maximum strength, and to break up coarse-grained, or otherwise unsatisfactory, metallurgical structures in the original materials. These reasons are frequently more important than the common aim to produce, by forging, a piece of such size as to give the minimum amount of machining". This was explained by M. B. Halpenny, mechanical designer at the Dominion Bridge Co., Ltd., Lachine, Que., before a large audience at the Jan. 8th meeting of the Montreal Chapter.

Steel for forging produced by the electric furnace has certain advantages over the open-hearth process, in that steels of the highest possible standards of cleanliness and reliability can be obtained. However, except for very high grade forgings, open-hearth steel is generally favored partly because of its lower cost and partly because it has less tendency to retain dissolved hydrogen, resulting in flakes and embrittlement.

"Improvement produced in steel by forging is governed, to some extent, by the ratio of reduction, and good general practice for mild steel is that the cross-sectional area of the body of the forging (as forged) shall not exceed one-fifth of the cross-sectional area of the original ingot, and that no part of the forging shall exceed two-thirds of the area of the original ingot", continued Mr. Halpenny.

Transverse strength tests require that the original steel must be as sound as possible. Sulphur should be low, and the manganese content high enough to insure that all sulphur will be combined in the form of manganese sulphide, since iron sulphide is detrimental to the transverse strength. Upsetting the forging at some stage of manufacture seems to improve the transverse properties, possibly by breaking up or intertwining the manganese sulphide "stringers", or parallel lines of weakness, produced by rolling or forging.

Referring to forging equipment, Mr. Halpenny stated that hammers up to 4000 or perhaps 6000 lb. are more convenient than presses and, because of the rapidity of the blow, the work is not chilled to the same extent as in a press. The press is useful for large work since there is little noise, practically no vibration, and it can exert its full force at any point in its stroke.

Mr. Halpenny's talk was supplemented by lantern slides showing equipment and operation in making forgings.

The coffee talk took the form of two sound films, in full color, on hydraulics, presented through the courtesy of the Railway Power & Engineering Corp., Ltd., and Adel Precision Products Corp.

Nelson's Data on Melting Cycles Hold Interest in Buffalo

Reported by G. F. Kappelt
Assistant Metallurgist, Bell Aircraft Corp.

L. H. Nelson, plant metallurgist of the Republic Steel Corp., spoke on the "Manufacture of Electric and Open-Hearth Steel" before the Buffalo Chapter's January meeting. Mr. Nelson, who is a past chairman of the Buffalo Chapter, outlined the construction, the method of heating, and the technical aspects of both types of furnace construction.

Of particular interest were analyses of both the melt and the slag at various time intervals during the melting cycle. Mr. Nelson also discussed the effect on the soundness and uniformity of steel produced by the use of various types of ingot molds, pouring techniques, and temperatures.

Brazilian Technical Mission Visits A.S.M.

The Brazilian Technical Mission, consisting of three professors from the University of Rio de Janeiro and three from the University of Sao Paulo, visited the national headquarters of the American Society for Metals on the morning of Jan. 18, during a tour of ten large cities in the United States in which engineering colleges are located.

The visit was designed primarily to familiarize them with United States teaching methods, but also included inspection trips which would illustrate applications of engineering and science to industry. The Brazilian professors were accompanied by J. Silvado Bueno of the Inter-American Development Commission.

14. FOUNDRY PRACTICE (*Cont.*)

14-36. **Gating and Feeding of Malleable Iron Castings.** A. T. Jeffrey. American Foundrymen's Association *Transactions*, v. 52, March '45, pp. 623-631.

Factors that influence the location and use of gates and feeders in the production of malleable iron castings. General rules modified by foundry operating conditions as well as by casting design. Discusses the variables encountered in foundry practices and illustrates the gating and feeding problems of various types of castings. Importance of considering molding sand conditions is particularly emphasized.

14-37. **Gating Malleable Castings.** D. I. Dobson. American Foundrymen's Association *Transactions*, v. 52, March '45, pp. 632-642.

In the gating of a malleable casting, first consideration is to obtain a good sound casting. Questions of yield, flask size, and practicability of gate removal should be considered and weighed against each other when there is a choice of one or more gatings which produce an equally sound casting. Attempt made to illustrate these points, and to show gatings for castings which most malleable men recognize as being vital to our armed forces.

14-38. **Heading and Gating Malleable Castings.** E. F. Waterbor. American Foundrymen's Association *Transactions*, v. 52, March '45, pp. 643-648.

Description of a method of heading and gating malleable castings and the application of this method to a particular casting, produced on a large scale with good results. This system has done much to enable the foundry to make sound castings and eliminate heavy feeders.

14-39. **Heat Flow Problems in Foundry Work.** Victor Paschkis. American Foundrymen's Association *Transactions*, v. 52, March '45, pp. 649-670.

Discussion of the more common thermal problems encountered in foundry work. Analogy method, which permits the solution of such problems. Application of the electric analogy method. The optimum size of the opening in the sand core between the casting and the feeding head of the casting. 10 ref.

14-40. **Alterations in Cast Iron Properties Accompanying Use of a Strong Inoculant of the Silicon-Manganese-Zirconium Type.** C. O. Burgess and R. W. Bishop. American Foundrymen's Association *Transactions*, v. 52, March '45, pp. 671-710.

Ladle inoculation has been found to produce cast irons of uniformly high physical properties of low chilling characteristics. Marked reduction in chill or wall sensitivity following inoculation has materially extended the composition range within which gray irons are resistant to chilling. The cast irons covered a carbon range of approximately 2.75 to 3.40% and a silicon range of 1.0 to 2.5%. A relatively low carbon content was indicated as essential for development of optimum mechanical properties. Essential functions of an inoculant, and tests made to determine the suitability of the silicon-manganese-zirconium inoculant employed.

14-41. **Reproducibility of Elevated Temperature Sand Test Results.** John A. Rassenfoss. American Foundrymen's Association *Transactions*, v. 52, March '45, pp. 711-732.

Study to determine the accuracy with which elevated temperature compression strength results can be reproduced at a single laboratory and between different plant laboratories. Five different sand mixes were made in triplicate at a single laboratory and tested at 2500° F. Results obtained for single batches in a series deviated from the average of the three batches made per series by 15% or less.

14-42. **Mold Surface Gas Pressure.** H. W. Dietert, R. L. Doelman and R. W. Bennett. American Foundrymen's Association *Transactions*, v. 52, March '45, pp. 733-749.

In the mold surface conditions existed which are described as hot permeability, gas volume back gas pressure, and mold gas flow. This subject presents a larger number of possible pitfalls since the amount of exact data and their correlation are rather limited in present-day literature.

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14-43. **The Elimination of Micro-Shrinkage by Accurate Thermal Dissipation.** Henry F. Hagemeyer. American Foundrymen's Association *Transactions*, v. 52, March '45, pp. 758-766.

New processes enable closer control of direction of heat dissipation, and this tends to eliminate micro-shrinkage. Metal resources must be conserved and production of castings approaching the theoretical maximum of sum total physical properties would contribute to that end. Discusses the thermodynamic approach to the problem and lists 16 factors which must be considered to produce such castings. Mold material considerations, gating and risering, location of cavities in the mold, solidification and mold cooling possibilities.

14-44. **Maintenance of Equipment.** Frank J. Dost. American Foundrymen's Association *Transactions*, v. 52, March '45, pp. 784-788.

Investigation of the maintenance set-up in the plant will prove to be profitable.

14-45. **Brazil Produces Steel Castings to Replace Forgings and Fabricated Parts.** Henryk Zimnawoda. American Foundrymen's Association *Transactions*, v. 52, March '45, pp. 871-883.

Describes castings produced to replace forged or fabricated parts, and the details of methods of molding, pouring, and heat treating these castings.

14-46. **Castings From the Consumers' Viewpoint.** L. A. Danse. American Foundrymen's Association *Transactions*, v. 52, March '45, pp. 884-888.

What the fabricator may expect in the future as to quality and cost.

14-47. **Special Low Carbon Steel for Castings.** C. G. Lutts and J. P. Hickey. American Foundrymen's Association *Transactions*, v. 52, March '45, pp. 904-912.

Study of the hot-tearing tendencies, disclosed by magnetic powder testing, in the bores of certain cast steel valves and fittings. Presents the results of investigations on the use of a special low-carbon steel as a hot-tear prevention measure.

14-48. **Apparatus and Method of Measuring Permeability in Plaster Molds.** John M. Neff. American Foundrymen's Association *Transactions*, v. 52, March '45, pp. 965-976. 14 ref.

Need for obtaining reliable data concerning the use of plaster of Paris and similar mold and core mixtures. Primary attention is given to the study of permeability and porosity and to the development of apparatus for testing permeability in plaster molds and cores.

15. SALVAGE AND SECONDARY METALS

15-1. **The Scrap Industry Anticipates No Trouble in Meeting Requirements of Steel Mills and Foundries.** Edwin C. Barringer. *Blast Furnace & Steel Plant*, v. 33, Jan. '45, pp. 77-78.

Inventories of home scrap and of pig iron remained fairly constant, but those of purchased scrap showed a progressive deterioration. Battlefield scrap; termination scrap; disposal of battlefield scrap.

15-2. **Effect of Alloying Elements on Aluminum Casting Alloys.** Walter Bonsack. American Foundrymen's Association *Transactions*, v. 52, March '45, pp. 789-813.

Shows the effect of minor alloying elements which cannot be removed from scrap metal commercially, but which, when diluted and blended properly have a place in aluminum alloys. Gives results obtained with a new series of alloys developed in the aluminum-magnesium-zinc type of alloy.

16. FURNACES AND FUELS

16-1. **Blast Furnace Tuyeres.** J. B. Fortune. *Iron & Steel*, v. 17, Dec. '44, pp. 704-708.

Tuyere life depends on a number of factors of which the principal are the quality of the metal used in their construction and the suitability of their design for the prevailing conditions. Given good metal and good design there are still various causes of tuyere failure: Normal wear, stoppage of cooling water circulation, dirty water and poor water distribution. Their effects and the means of overcoming them discussed. Abnormalities in furnace operation have led to variations in tuyere design, and examples of these, including dipping and non-radial blowing tuyeres, given.

16-2. **Modern Trends in Blast Furnace Design.** Frank Janecek. *Iron & Steel Engineer*, v. 21, Dec. '44. pp. 37-40, 73.

Since World War I, the number of blast furnaces in the United States has steadily decreased while their size steadily increased. Performance of the large modern units would indicate that even larger furnaces can be operated successfully.

16-3. **A Producer Gas Fired Furnace Installation.** *Wire Industry*, v. 2, Dec. '44, pp. 611-612.

Installation for the heat treatment of bars and sections, the plant consisting of four heat treatment furnaces, two oil quenching tanks, one water quenching tank, four loading platforms and an electrically-operated wedge-type high speed charging machine. Designed for a continuous output in either hardened and tempered, annealed or normalized conditions, of alloy and special steel bar and section stock.

16-4. **Automatic Ovens.** *Steel*, v. 116, Jan. 15, '45, p. 92.

Complete furnace cycle, from heating to quenching, is provided by units incorporating several unusual handling features.

16-5. **Heat Flow.** R. Jackson, R. J. Sarjant, J. B. Wagstaff, N. R. Eyres, D. R. Hartree, and J. Ingham. *Iron & Steel*, v. 17, Dec. 7, '44, pp. 786-793.

Technique of calculation, and its practical application.

16-6. **Blast-Furnace Practice.** T. P. Colclough. *Iron & Steel*, v. 17, Dec. 7, '44, pp. 799-803.

Considerations of changes necessary for fuel reduction.

16-7. **New Design of Horizontal-Type Foundry Oven for Baking Cores.** *Industrial Heating*, v. 12, Jan. '45, pp. 98, 103-104.

Has four levels of horizontal core travel.

16-8. **Modern Blast Furnace Design and Operation, II.** James Dale. *Blast Furnace & Steel Plant*, v. 33, Jan. '45, pp. 84-89.

Details of construction. (Abstract of paper read before the West of Scotland Iron and Steel Institute.)

16-9. **Coreless Induction Furnace Practice.** Karl Boer. (*Elektrotechnische Zeitschrift*, v. 65, no. 19/20, May 17, '44, pp. 185-189.). *Engineers' Digest* (American Edition), v.-2, Jan. '45, pp. 44-46.

Operation of a coreless induction furnace; circuits for coreless induction furnaces; electrical measurements of the furnace plant.

16-10. **Queen City Steel Treating Company Plant Features Modernized Production Set-up.** *Industrial Heating*, v. 12, Jan. '45, pp. 129-132, 134, 136, 138-139, 141.

Facilities available for electric-furnace copper brazing on a production basis; describes the various furnaces and other equipment installed.

16-11. **Foundry Coke: A Critical Study.** B. P. Mulcahy. American Foundrymen's Association *Transactions*, v. 52, March '45, pp. 819-845.

Explanation of the chemical reactions taking place during the combustion of coke in a cupola and how the reactions and their locations vary with air pressure, size of coke and make-up of the charge. Recommendations regarding the cupola air, and size and character of the material charged. Describes the manufacture of a by-product foundry coke and its characteristics. 8 ref.

17. REFRACTORIES AND FURNACE MATERIALS

17-1. **Drilling Pyrometer Holes Through Furnace Linings.** K. J. Trigger. *Metal Progress*, v. 47, Jan. '45, pp. 95-96.

Drilling 1⅜-in. holes through a 5-in. firebrick sidewall.

17-2. **Significance of a Testing Program for Glass-Plant Refractories.** R. K. Smith. American Ceramic Society *Bulletin*, v. 23, Dec. 15, '44, pp. 457-460.

The economic significance of testing refractories; two general types of refractory failures (those due to heat alone and those due to heat plus contamination) considered. Tests applicable to each type discussed. A sag test and a reheat test which have been found useful in evaluating failures due to heat alone described; factors involved in testing refractories for failure from chemical attack discussed.

17-3. **Significance of Navy Spalling Test.** W. T. Tredennick. American Ceramic Society *Bulletin*, v. 23, Dec. 15, '44, pp. 460-463.

With the development of the Navy spalling test, thermal spalling in naval boilers has been reduced from a major to a minor cause of failure. The advantages of the test are pointed out and illustrated by showing the results of service trials of brick giving 26, 8, 3.5 and 1% loss in the test.

17-4. **Reheat Tests on Fire-Clay and Silica Refractories.** Earl C. Petrie and Charles P. Walters. American Ceramic Society *Bulletin*, v. 23, Dec. 15, '44, pp. 464-468.

Test data on fire-clay and silica refractories are presented which show the effect of firing temperature and its relation to the changes brought about in the standard A.S.T.M. reheat tests.

17-5. **The Practical Aspects of Reheating and Heat Treatment Furnace Insulation.** A. Stirling. Institute of Fuel *Journal*, v. 18, Dec. '44, pp. 39-50.

After-insulation depends on structural factors which cannot be entirely separated from operational, and possibly design factors. An inspection of the structure must precede after-insulation. Circular roofs must have a suitable thickness and rise for their span. Sidewall insulation expansion joints should be carefully detailed. Air spaces may often be insulated with powder fillings. Hearth and foundation insulation is facilitated by the insulated concretes. The insulating refractories and concretes are appropriate to hearths of mechanical furnaces and to bogies and bogey tracks. 32 ref.

17-6. **Basic Brick in Open-Hearth Construction.** H. M. Griffith. *Blast Furnace & Steel Plant*, v. 33, Jan. '45, pp. 104-106.

Experiments with all basic construction on one end of a 50-ton furnace; after 750 heats on the furnace the basic brick was standing up well. Rebuilding time was less than half of that required on the silica end. Removal of slag was no problem as it was granular in character and was raked out from time to time while the furnace was in operation.

17-7. **Refractories in 1944.** Louis A. Smith, *Blast Furnace & Steel Plant*, v. 33, Jan. '45, pp. 114-115.

Low alumina, super silica brick is now accepted and coming into its own in plants where it was considered more of a fancy than a fact. Keener interest in brick made from conglomerate rock has sprung up. The all basic furnace; cold rammed bottoms; the Mt. Savage Plant; industry should establish refractories research.

17-8. **Economic Thickness of Thermal Insulations for Intermittent Operations, Part II.** C. B. Bradley, C. E. Ernst and V. Paschkis. *Industrial Heating*, v. 12, Jan. '45, pp. 114, 116, 118, 120, 123-124, 126.

Presents a method for determining economic thickness based upon the electrical analogy method. Application of the method and its limitations are discussed at length. Influence of intermittency on the economic thickness is discussed for one specific case.

17-9. **Converter Refractories.** Wm. C. Cress. American Foundrymen's Association *Transactions*, v. 52, March '45, pp. 854-870.

Describes the tests and procedures used to select the proper materials and mixture. The mixture selected on this basis gave better than 100% improvement in refractory lining life over a previous mixture. 10 ref.

17-10. **High Temperature Heat Insulation.** G. W. Paterson. American Foundrymen's Association *Transactions*, v. 52, March '45, pp. 927-944.

Methods and applications for the use of various types of insulating and refractory insulating materials. Comparisons are made as to the heat loss sustained under various types of construction. Consideration is also given to the "maturing" effect upon certain refractories when insulation is used and also places where it should not be used.

Metal Literature Review—*Continued*

18. HEAT TREATMENT

18-1. Subzero Treatment of Steels. H. C. Amtsberg. *Western Metals*, v. 2, Dec. '44, pp. 34, 36-38.
Presentation of the fundamentals of cooling hardened steels to temperatures considerably below room temperature, properly correlated with the basis treatment cycle and related structural changes. 11 ref.

18-2. Some Peculiarities of Heating Steel by Induction. George I. Babat. *Journal of Applied Physics*, v. 15, Dec. '44, pp. 835-839.
The principal electrical and magnetic characteristics of steel; the striated heating effect.

18-3. The Nitriding of High-Speed Steel. *Machinery* (London), v. 65, Dec. 7, '44, pp. 627-630.
Pots and furnaces used for salt bath; pre-requisites for the successful application of the process; length of time of heating in the bath for different types of tools; other examples of the application of the process; nitriding tools by the Maxi process.

18-4. Nitrided Steels. E. Ineson and C. Petteford. *Iron & Steel*, v. 17, Dec. '44, pp. 735-738.
Mechanism of the process and choice of materials. 16 ref.

18-5. Job Shop for Induction Heating. Rex Baubie. *Steel*, v. 116, Jan. 8, '45, pp. 120, 136.
Economic value of "farming out" such work to a specializing shop is more pronounced because of (1) high cost of the equipment, (2) the limited use it would have, (3) the trained technicians its operation requires and (4) the per-unit cost of work turned out.

18-6. High Frequency Induction Heating New Tool for the Metal Working Industry. A. O. Wood. *Steel Processing*, v. 30, Dec. '44, pp. 795-799.
Principles; equipment; significant industrial applications.

18-7. Application of Controlled Atmospheres to Metal Processing. C. E. Peck. *Steel Processing*, v. 30, Dec. '44, pp. 801-804.
Annealing, hardening of ferrous metals; gas carburizing; ferrous metal brazing; sintering or powder metallurgy applications. (Presented at the semi-annual meeting, June, 1944, of the American Society of Mechanical Engineers.)

18-8. Reactions Between Hot Steel and Furnace Atmospheres. Floyd E. Harris. *Metal Progress*, v. 47, Jan. '45, pp. 84-89.
Gas reactions with metallurgical products involve thermodynamic considerations. A simplified tabulation presented which requires a minimum of explanation in its application to common furnace atmospheres. Eleven reactions involving formation of compounds from five elements—carbon, oxygen, hydrogen, nitrogen and iron—are charted. Adaptability of tabulation to specific processes explained.

18-9. Who Knows About Temper Colors on Stainless Steels? *Metal Progress*, v. 47, Jan. '45, p. 94.
The use of temper colors may be made in tracing heat patterns, as for example, around welds supplanting its former use as a guide to heat treatment. A plea for more information.

18-10. Continuous Heat Treating of Armor Steel Castings. Edwin F. Cone. *Metals & Alloys*, v. 20, Dec. '44, pp. 1593-1597.
Sound furnace design and engineering and the application of advanced mechanization have made possible one of the war's most impressive processing achievements—the continuous heat treating of large cast steel tank components to close mechanical property tolerances and production requirements in an installation hitherto unmatched in size. The general engineering problem involved and the plant methods and equipment employed to solve it described.

18-11. Heat-Treatable Nickel Alloys. W. J. Kroll. *Metals & Alloys*, v. 20, Dec. '44, pp. 1604-1606.
Information on composition and general age-hardening behavior of the nickel-base alloys. 13 ref.

18-12. Modification by Heat Treatment of Cast Structures and Properties. H. T. Angus. *Foundry Trade Journal*, v. 74, Dec. 14, '44, pp. 305-307.
Discussion on a paper presented at the annual conference of the Institute of British Foundrymen. Izod values; keel bar test results; temperature of water for quenching; center line dendrites; inclusions and size of dendrites; incidence of temper carbon; the removal of dendritic formation.

18-13. Sub-Zero Treatment of Steel. H. C. Amtsberg. *Iron Age*, v. 155, Jan. 11, '45, pp. 50-53.
Fundamentals of cooling hardened steels to temperatures considerably below room temperature properly correlated with the basic treatment cycle and related structural changes. 11 ref.

18-14. Producer Gas-Fired Furnaces. *Automobile Engineer*, v. 34, Dec. '44, pp. 539-540.
An installation for the heat treatment of alloy and special steels.

18-15. Oxy-Acetylene Heating and Flame Treating. *Oxy-Acetylene Tips*, v. 24, Jan. '45, pp. 21-26.
Hardening; flame hardening; methods of flame hardening; flame softening; flame strengthening; drawing; forming and bending; straightening; wrinkle-bending; flame descaling; flame priming; melting.

18-16. Short Cycle Malleabilization of White Cast Iron. E. E. Howe. *Iron Age*, v. 155, Jan. 18, '45, pp. 66-68.
Reduction in heat treating time achieved by a procedure in which the massive cementite in the white cast iron is first decomposed and the resulting pearlite matrix is converted to spheroidized cementite, having satisfactory ductility.

18-17. Pickling Eliminated by Continuous Salt Bath Anneal. *Iron Age*, v. 155, Jan. 18, '45, p. 69.
Full annealing of brass cartridge cases on a continuous production heat treating basis with longest continuous conveyor-type salt bath furnaces in operation and with an absence of oxidation.

18-18. Accurate Heat-Treatment Speeded by Push-Button Control. James F. Carland and P. R. Watson. *Aviation*, v. 44, Jan. '45, pp. 145-146, 243-245.
Saving time, material, and manpower, new oven automatically governs heat treatment of sheet materials, with labor effort reduced to mere operation of push buttons.

18-19. Heat-Treatment. *Aircraft Production*, v. 7, Jan. '45, p. 31.
Regenerative town gas furnace.

18-20. A Producer Gas-Fired Furnace Installation for the Heat-Treatment of Alloy and Special Steel Bars. *Metallurgia*, v. 31, Dec. '44, pp. 97-98.
Installation for the heat treatment of alloy and special steel bars which is fired with producer gas.

18-21. Protective Atmospheres in the Heat Treatment of Metals. F. Delaroziere. (*Journal des Usines a Gaz*, v. 68, no. 1, Jan. 15, '44, pp. 2-4.). *Engineers' Digest* (American Edition), v. 2, Jan. '45, pp. 18-20.
Protective gases for non-ferrous metals; heat treatment furnaces with protective atmospheres.

18-22. Medium Frequency Induction Hardening. G. Seulen and H. Voss. (*Stahl und Eisen*, v. 63, no. 51, '43, pp. 929-935; and no 52, '43, pp. 962-965.) *Engineers Digest* (American Edition), v. 2, Jan. '45, pp. 27-30.
Induction hardening carried out either by simultaneously heating the entire surface to be hardened and quenching it as a whole, or by heating and quenching individual portions of the piece by feeding it through the stationary induction device; or the movable induction coil may be passed over the stationary piece. As the shape of the induction coil must be chosen in accordance with the contour of the piece to be treated, the closed coil enveloping the piece can only be used in cases shown. For plane surface hardening, an open coil must be used. Quenching is carried out with the device in place, the quenching medium being applied to the heated surface by way of holes in the heating device. For progressive feed hardening combined with rotation of the piece, both the closed and the open type of induction coil are in use.

18-23. Heat Treating. L. S. Cooch. *Fasteners*, v. 1, no. 4, '44, pp. 11-15.
Heat treating procedures have a vital influence upon product quality and performance—progress has been made to a point where heat treatment can be controlled so that all product requirements can be met.

18-24. Prepared Atmospheres Used in Furnaces for Heat Treating at Chrysler Tank Arsenal. *Industrial Heating*, v. 12, Jan. '45, pp. 19-20, 22, 24, 26, 28, 30, 32, 34-36, 38, 104.
Use of prepared atmosphere in all of the heat treating furnace heating chambers which operate in the higher temperature range. Another feature is the economy of space effected by careful layout of the department and placement of the equipment.

18-25. The Principles and Practice of Lithium Heat Treating Atmospheres, Part III. Charles E. Thomas. *Industrial Heating*, v. 12, Jan. '45, pp. 42, 44, 46.
Use of lithium metallic vapor in atmospheres in the heating chambers of industrial furnaces for the prevention of scaling and decarburization, as carrier gas for gas carburizing, for descaling, and for restoration of carbon to decarburized steel. Carbon restoration and descaling covered here.

18-26. From the Science of Refrigeration. N. Nesselmann. *V. D. I. Zeitschrift*, v. 88, Feb. 19, '44, pp. 104-106.
Symposium of the refrigeration section of V. D. I., which took place Oct. 15, '43. Short abstracts of the papers presented.

18-27. High Speed Heating with Gas. *Steel*, v. 116, Jan. 22, '45, pp. 86-90, 129-130.
Recent improvements in equipment have forced the old rule-of-thumb heat penetration rate of 1 hr. per in. of thickness to give way to 2 to 4 min. per in. Billets, bars, tubing and strip may be brought up to high temperature in a matter of minutes as part of automatic continuous operations.

18-28. Problems Encountered in Making and Heat Treating Castings of an Air-Hardening Steel. Gordon W. Johnson. American Foundrymen's Association *Transactions*, v. 52, March '45, pp. 814-818.
Describes the cleaning, machining, and heat treating of air-hardening steel castings which will meet the requirements of low distortion, hardening throughout, and freedom from strains and cracking.

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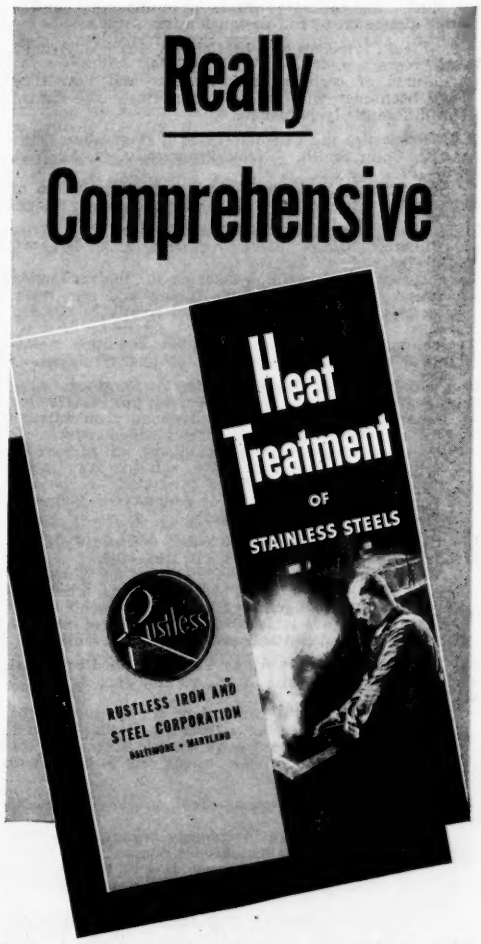

Here in compact but complete form is material never before published on the heat treatment of stainless steels. Hardening, surface hardening, stress-relieving, tempering and annealing are treated in simple, easily understandable language. There is a complete chapter devoted to the solution of problems. There is also information as to equipment, furnace atmospheres, scale removal, passivation, and hardness testing. An envelope on the back cover contains removable cards, condensing the instructions for heat-treatment of the standard grades of stainless.

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Metal Literature Review

19. WORKING
Rolling, Drawing, Pressing, Forging

19-1. **The Manufacture of Large Marine Engine Forgings.** Robert Liston. West of Scotland Iron & Steel Institute *Journal*, v. 51, part 5, pp. 107-121.
Deals with the shaping or forging of the required component from the ingot under a hydraulic forging press.

19-2. **Hydraulically Pressed Light Alloy Pistons.** Cecil Kimber. *Metallurgia*, v. 31, Nov. '44, pp. 31-38.
Developments in the application and processing of light alloys for pistons. Increasing need for greater strength for a given weight, under arduous operating conditions, led to the use of forged light metal pistons instead of the cast type. Two methods of producing wrought pistons are considered—hammered and pressed forgings—and particular attention is directed to the latter method for which the blanks are prepared by extrusion. Reference is made to the plant and equipment used in works especially designed for the production of light alloy pistons by the pressed method.

19-3. **Heading Capacity of Rivet Wire.** *Light Metals*, v. 7, Dec. '44, pp. 607-610, 612-614.
Theory and practice of a new testing system designed to meet production requirements. (*Aluminum* [Germany], v. 24, May '42, p. 60.)

19-4. **Shearing Flat Rolled Steel.** F. E. Flynn and D. A. MacArthur. *Iron & Steel Engineer*, v. 21, Dec. '44, pp. 41-65.
Although shearing is a relatively old process, almost no practical data have been available on the subject. Test results presented through the cooperation of the steel plant and the equipment manufacturer.

19-5. **Semi-Finished Steel.** Ross E. Beynon. *Iron & Steel*, v. 17, Dec. '44, pp. 722-726.
Describes some of the mills used for making these products, the rolling practices generally used, and a brief discussion of roll design for this service.

19-6. **Steel Cartridges of 3-In. Caliber.** Fred M. Arnold. *Metal Progress*, v. 47, Jan. '45, pp. 67-74.
Resumé of cartridge requirements and how they have been met with plain carbon steel, cold drawn and differentially hardened.

19-7. **Properties and Characteristics of Magnesium Forgings.** J. Colin Smith. *Metal Progress*, v. 47, Jan. '45, pp. 97-102.
Specifications and mechanical properties; choice of alloy; cost; applications; forgings versus castings; design.

19-8. **Upset Forging with the Flash Welder.** H. J. Males and Gilbert C. Close. *Steel Processing*, v. 30, Dec. '44, pp. 791-793, 805.
Resistance flash welding machine for the production of upset forgings from both tubing and bar stock. Process is not only economical and relatively fast but produces a product that requires a minimum of finish machining, and that retains grain flow and other metallurgical characteristics, pertinent to quality output.

19-9. **Metallurgical Control of Aircraft Forgings.** A. J. Pepin. *Steel Processing*, v. 30, Dec. '44, pp. 771-779.
Metallurgical control maintains quality on existing parts, and assures it in new designs which require the development of new forging techniques. Illustrates the metallurgical organization chart with the various operating departments. (Paper presented at National Aeronautics Meeting, Society of Automotive Engineers, October 5-7, 1944, Los Angeles).

19-10. **Aluminum Bronze Extrusions.** Frank J. Miller. *Metals & Alloys*, v. 20, Dec. '44, pp. 1598-1603.
Method and equipment for extruding aluminum bronze described for the first time in this article not only represent a significant engineering achievement but also make available to designers a new material, whose characteristics and present uses are outlined.

19-11. **Light on Metalworking Trends is Shed by ASME Papers.** Guy Hubbard. *Steel*, v. 116, Jan. 8, '45, pp. 82-83, 137.
One of the several conclusions to be drawn from study of annual meeting transcripts is that scientific analyses of experimental work done in shop are yielding data on which postwar designs can be based with minimum of guess work.

19-12. **Forging Tube Forms.** *Steel*, v. 116, Jan. 8, '45, pp. 92, 94, 96.
Power hammers are ingeniously revamped to forge nose and tail on tube sections for bombs, using manually operated wheel and screw devices to feed work to dies. Automatic mechanisms rotate tubing continuously.

19-13. **Universal Slabbing Mill Differs From Most Designs.** A. G. Ericson. *Steel*, v. 116, Jan. 8, '45, pp. 108, 110.
Vertical rolls are separate from drives and are equipped with detachable couplings to facilitate roll changes. Mill rolls are direct driven through universal spindles by individual motors and can be reversed in three seconds. Wet and dry scale disposal systems are provided. Gas scarfing machine is operated from pulpit by push button control.

19-14. **Utilizing Rubber Dies in Hydraulic Presses.** *Machinery*, v. 51, Jan. '45, pp. 152-156.
Use of rubber in die cutting and forming operations on a type of hydraulic press developed by the British Ministry of Aircraft Production.

19-15. **The New Countour Developer Simplifies the Building of Master Contours.** Jack L. McGraw. *Modern Industrial Press*, v. 6, Dec. '44, pp. 13-14, 46.
The amazing contour developer, a welcome boon to the overwrought pattern and die making industries, is not inconceivable but it is unbelievable. Developed entirely by the Contour Co. of Pasadena, Calif., it proves unquestionably that templates are unnecessary prerequisites in the building of excellent master contours.

19-16. **Production Problem of Weiss Joints Solved by Chevrolet.** P. D. Aird. *Modern Industrial Press*, v. 6, Dec. '44, pp. 16-18.
When the military services became the one and only customer of the nation's auto plants they inaugurated many widespread and fundamental changes in products and production in transforming machines geared to production for civilian use to the task of providing material for war.

Gill Describes Best Structures For Carbon Tool Steel

Reported by A. H. Rauch
Deere & Co.

"Recent Developments and New Procedures of Handling Carbon Tool Steels" was the subject presented by James P. Gill, vice-president of Vanadium-Alloys Steel Co., before the Tri-City Chapter of the A. S. M. on Dec. 12.

A mixed lamellar and spheroidal structure was described as best for machining and for subsequent hardening of carbon tool steel. To reduce distortion in hardening a stress relieving treatment between rough machining and final machining was recommended. This treatment consists of heating at 1100 to 1300° F., followed by slow cooling.

The importance of holding grain size to a minimum and of maintaining surface chemistry within limits was emphasized by Mr. Gill. It was pointed out that decarburization may sometimes be responsible for cracking due to the higher M_s point of the lower carbon surface.

That the hardenability of hypereutectoid steels is less than that of a eutectoid steel was attributed to the presence of residual carbides. These carbides are responsible for extremely fine grain size and also act as points of nucleation for the transformation of austenite.

In the discussion period following the lecture, Mr. Gill stated that considerable evidence exists that subzero treatment of high speed steels is effective only when it is the last treatment given the tool in the heat treating cycle. This phenomenon might possibly be due to residual stresses set up in the tool which oppose the normal service stresses. Sub-zero treatment of a properly heat treated tool results in improvement only of certain types of tools which ordinarily show very low service life.

New Type of Stainless Steel Being Developed for Airplanes

There is good reason to believe that a new type of stainless steel soon will be perfected which can be substituted for duralumin in aircraft, the Muncie Chapter of the A.S.M. was told on January 10 by A. L. Feild, director of the research division of Rustless Iron and Steel Corp.

This particular structural use of stainless steel must await full development of a precipitation-hardening type which can be readily formed and then hardened by heating to relatively low temperatures, but such a commercially accepted alloy is reasonably close to realization, Mr. Feild reported in his talk.

"The volume of research in stainless steel metallurgy is far greater today than ever before in the history of the industry, and while such researches now are almost entirely given over to war problems the results will be adapted to the peacetime economy very quickly after victory", Mr. Feild stated.

One of the most interesting aircraft applications is in the construction of the turbo supercharger, which draws in the rarefied atmosphere of the substratosphere, compresses it and delivers it to the engines. Operating temperatures within the turbo supercharger may be as high as 1500° F., while that of the surrounding atmosphere may be —40° F.

Other interesting applications of stainless steel lie in the field of gas turbines and jet propelled planes. During the war the technique of welding hardened armor plate with stainless steel electrodes to secure strength and toughness has made great strides. Wartime experience has trained thousands of shops throughout the country in the proper technique for heat treating and machining stainless steel, which will be extremely helpful during the period of postwar conversion.

Brooks Short, Delco-Remy research engineer, also presented an extremely interesting 20-minute discussion on Radar. He simplified and illustrated the fundamental basic operations of this electronic device so cleverly that every man present could understand him.

Industrial Steels Engages Agency

Industrial Steels, Inc., and its newly formed subsidiary, Stainless Surface Hardening Co., both of Cambridge, Mass., announce the appointment of the John Mather Lupton Co., New York City, as advertising and marketing counsel.

Industrial Steels is one of the largest distributors of stainless steels in New England. Stainless Surface Hardening Co. markets a patented process for surface hardening of stainless steel parts and is installing a modern specialty heat treating department.

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A.S.M. Review of Current Metal Literature—*Continued*

19-17. Designing of "Trouble-Free" Dies. C. W. Hinman. *Modern Industrial Press*, v. 6, Dec. '44, pp. 26, 28.

Here is a practical method for drawing deep shells of square or rectangular cross-sections, and with sharp corners. The same idea can be expanded for drawing other cross-sectional shapes having square corners, and to any reasonable depths.

19-18. Low Priced Blank and Pierce Dies, II. James Walker. *Modern Industrial Press*, v. 6, Dec. '44, pp. 38, 40, 42, 44, 46.

When given a die to construct, the die maker should not immediately order out material. When tool designs are not available, plenty of study should be given the part in order to arrive at the best construction possible, dealing with the size, shape, material to be blanked, quantity, and the way the grain should run. The latter is most important, because if the parts are to require forming after the blanking operation, the grain of the material might be affected by the die layout. Therefore, in such cases, all bends should be made to at least 20° of perpendicular to the grain, preferably 90° to the grain. To carry out this rule, sometimes the die will have to be laid out at an angle to insure the correct location of the grain.

19-19. Hot-Forming Magnesium. *Machinery* (London), v. 65, Dec. 14, '44, pp. 655-658.

Application of magnesium in airframe construction has been retarded in the past because of the difficulty in forming this metal to the many contours required in plane-building. Information to overcome this difficulty should be of considerable value to airplane designers and production men.

19-20. Shaping Aluminum With Steel Dies. *Steel*, v. 116, Jan. 15, '45, pp. 78-79, 116, 119.

Ford defies conventional practices in making bomber parts by adapting technique acquired in fabricating steel fenders and body parts for automobiles. Stack drilling of rivet holes replaced by use of piercing dies.

19-21. Rolling Mills and Practice in 1944, and Present Trends in Design and Operation. G. G. Beard. *Blast Furnace & Steel Plant*, v. 33, Jan. '45, pp. 100-103.

Little evidence of the advances made or contemplated in rolling mills and rolling mill practice due to conditions imposed by the present stage of the war. Unitemper mill; Krause cold reducing mill; design directed to specialty mills; bar, merchant and rod mills to produce better surface; changes due in cold strip rolling mills.

19-22. Electrical Developments in the Steel and Non-Ferrous Industries. G. E. Stoltz. *Blast Furnace & Steel Plant*, v. 33, Jan. '45, pp. 107-108.

Rolling of flat products, such as strip, tin plate and sheet in the steel industry and brass strip and aluminum foil in the non-ferrous industry continues to develop along the line of producing still thinner gages. During the last five years, a million kva. capacity of electric arc furnaces has been installed. This has been done to supply alloy steel for munitions. Most of the installations which have been made are of large capacity furnaces using up to 15,000 kva. of transformers.

19-23. Recent Developments as They Pertain to Rolling Mill Practice. David McAllen Henderson. *Blast Furnace & Steel Plant*, v. 33, Jan. '45, pp. 109-110, 158.

Temperature and time at temperature; spark testing helpful; use of electric eye; electrical handling of material.

19-24. Universal Slabbing Mill Will Roll All Grades of Steel Including Stainless and Alloy. A. G. Ericson. *Blast Furnace & Steel Plant*, v. 33, Jan. '45, pp. 111-113.

Roller bearings on mill rolls; gas scarfing machine; disposal of crop ends.

19-25. Electrical Development and Progress in the Steel Industry. F. Mohler. *Blast Furnace & Steel Plant*, v. 33, Jan. '45, pp. 116-118, 152.

Blooming and slabbing mills; plate mills; hot-strip mills; other mills; adjustable-voltage auxiliaries; processing lines.

19-26. Computation of Roll Pressure in Cold Straightening of Tubes and Rods. E. Bernhult. (*Jernkontorets Annaler*, v. 128, no. 4, April '44, pp. 137-160). *Engineers' Digest* (American Edition), v. 2, Jan. '45, pp. 23-26.

Power requirements of the straightening process proper; rolling friction between material and rolls; sliding friction between piece and guide; bearing friction; idle power consumption; total power consumption. 6 ref.

19-27. The Uni-Temper Mill and Process. M. D. Stone. *Iron & Steel Engineer*, v. 22, Jan. '45, pp. 37-47, 67.

Operating experience on the first installation of this new mill design has shown that the product has definitely different characteristics, while operating economy is attractive. 5 ref.

19-28. Recent Developments in Forging Practice. W. W. Dyrkacz and L. B. Fonda. *Steel*, v. 116, Jan. 22, '45, pp. 82-84, 124.

Applications, die design, materials which may be forged, effect of composition on forgeability and heat treatment, as well as the techniques employed in plants of the General Electric Co. Advantages and disadvantages set forth.

19-29. Deep Drawing 0.67-Inch Plate. George R. Reiss. *Steel*, v. 116, Jan. 22, '45, pp. 92, 94, 96.

Amazing press job forecasts important revisions in manufacturing many products.

20. MACHINING AND MACHINE TOOLS

20-1. Tap Grading System Reduces Scrapped Threads. C. D. Savage. *Iron Age*, v. 154, Dec. 28, '44, pp. 38-41.

Predetermining the actual cutting size of a tap for a specific material prior to placing the tap on a production job reduces scrap caused by torn and oversize threads to a minimum and has provided for selective fits to within 0.0003 in.; has also greatly increased tap life and reduced lost time attributable to premature tap failure. A series of carbide thread plug gages in steps of 0.0003 in. are used for checking the thread produced in a test block.

20-2. Broaching Versus Milling in Manufacturing Rifle Parts. I. A. Swidlo. *Iron Age*, v. 154, Dec. 28, '44, pp. 46-49.

Illustrates broach fixture designs and tooling for machining a small, fragile part.

20-3. Machining Light-Alloy Castings for the Merlin Engine. *Machinery* (London), v. 65, Nov. 23, '44, pp. 561-565.

Use of high speed routing machines, for reproducing special forms. An example of the use of such routing machines is in the production of supercharger vane rings.

20-4. High-Cycle Milling. J. S. H. *Machinery* (London) v. 65, Nov. 23, '44, pp. 567-570.

Milling aluminum up to 19,000 ft. per min.

20-5. Electronic Drive Gives Old Machines New Life. V. Mancuso. *Western Metals*, v. 2, Dec. '44, pp. 58, 60.

The Axelson Manufacturing Co. recently installed Westinghouse electronic motor drives on three 30-yr.-old Heald grinders resulting in: (1) improved quality of precision finishing; (2) vibration-free, stepless speed control over a 20-to-1 speed range; and (3) better working conditions

20-6. Development in Electric Drive of Machine Tools. *Machinery* (London), v. 65, Nov. 30, '44, pp. 599-602.

Speed control by change-pole motors; stepless speed variation by alternating-current motors; stepless speed variation, Ward-Leonard control; rectifying valves; speed control from rectified current; application to spar-milling.

20-7. Profile Turning. *Automobile Engineer*, v. 34, Dec. '44, p. 546.

An interesting development for machining cam forms.

20-8. Contour Machining. *Automobile Engineer*, v. 34, Dec. '44, pp. 549-550.

A new hydraulically operated duplicating unit.

20-9. Progress in the Mechanisms of Production. Lester V. Colwell. *Metal Progress*, v. 47, Jan. '45, pp. 90-93.

Materials: Basic metals; carbide tools; powder metallurgy; synthetics. Pre-fabrication of materials: Sand casting; centrifugal casting; forging and die casting; powder metal products; precision casting. Fastening of components. Machine tools and operations: High speed milling; machine tool designs; form copying machines; controls.

20-10. Selecting Carbides for Milling. Fred W. Lucht. *Steel*, v. 116, Jan. 8, '45, pp. 84-85, 126.

"Wrong" grade correctly used often will provide better results than "right" grade improperly handled. Five types provide optimum performance and cutter life for most milling operations.

20-11. Pneumatic Power in the Machine Shop. *Steel*, v. 116, Jan. 8, '45, pp. 90, 130.

Applications for pneumatic power in the machine shop have grown from conventional jobs such as hoisting, drilling, chipping, drying and cleaning machinery, to counterbalancing the weights of various machine parts, positioning heavy workpieces by actuating an indexing fixture, and for many other progressive developments. Satisfactory installations affording ease of control, greater speed and low maintenance costs will remain after war's end.

20-12. All Teeth Are Produced Simultaneously in New Method for Cutting Gears. *Steel*, v. 116, Jan. 8, '45, pp. 112, 135.

Radially fed form-tooth blades are capable of rough and semi-finish cutting as many as 60 to 100 or more gears per hour.

20-13. The Gipsyqueen, II. J. A. Oates. *Aircraft Production*, v. 6, Dec. '44, pp. 563-574.

Special fixtures for operations on the crankcase top cover; machining the camshaft; gears; final engine assembly and test.

20-14. Spar Production, II. Wilfred E. Goff. *Aircraft Production*, v. 6, Dec. '44, pp. 599-607.

Milling center-section booms; web production; assembly drilling.

20-15. Postwar Design Trends in Machine Tools. *Iron Age*, v. 155, Jan. 11, '45, pp. 54-56.

Recent announcements of the builders indicate that greater automaticity without sacrifice of flexibility will feature models of the future. Trends in machine shop practice also covered in this review of 1944 activity.

20-16. Broaching Vs. Milling in Manufacturing Rifle Parts. I. A. Swidlo. *Iron Age*, v. 155, Jan. 11, '45, pp. 57-60.

Shows how broach tools are checked and describes some unconventional machines for broaching curved surfaces. Summarizes the savings in capital investment over the installation of milling machines and lists the reduction in direct manufacturing costs obtained by substitution of broaching for milling on a dozen parts of the Garand Ml rifle.

20-17. Machining Airplane-Engine Cylinder Barrels. *Machinery* (London), v. 65, Dec. 14, '44, pp. 645-649, 651-653.

Cylinder barrels are machined from forgings of Hiduminium alloy, a material which combines strength with lightness and good heat-conducting properties. Stages in the production of the cylinder barrel are illustrated.

20-18. Converting a Centre-Type Grinding Machine to a Centreless Grinder. J. Kee. *Machinery* (London), v. 65, Dec. 14, '44, pp. 662-663.

Cast iron bracket carrying the spindle upon which is mounted the control wheel.

20-19. Negative-Rake Turning and Boring. George M. Jalma. *Machinery*, v. 51, Jan. '45, pp. 135-146.

Development of titanium and tantalum tungsten carbides inaugurated a new field for carbide tools—the machining of steel. Northern Ordnance Inc. has conducted considerable research on negative-rake tools. Article deals with tools of that type employed in turning, boring, and planing operations.

20-20. Broaching Applied in a Constantly Broadening Field. O. W. Bonnafe. *Machinery*, v. 51, Jan. '45, pp. 158-162.

Broaching, once thought of as applicable chiefly to keyways and splines, is today replacing many other types of machining operations in mass production manufacturing practice.

20-21. Precision Tooling for Mass Production. Gerald Eldridge Stedman. *Tool Engineer*, v. 15, Jan. '45, pp. 67-70.

Ingenious machine and tool engineering results in the economical production of aluminum hydraulic valve. Western firm's autmatic recessing machine features cam control through hollow spindle.

20-22. Recent Progress in High Speed Tapping, III. C. W. Hinman. *Modern Machine Shop*, v. 17, Jan. '45, pp. 156, 158, 160, 162, 164, 166, 168, 170, 172.

Tapping efficiency affected by weight of fixture; air-operated fixtures; fixtures for high speed tapping; circular dial feed fixtures; tapping plastics; grinding taps.

20-23. Look for the True Rake. M. Kronenberg. *Modern Machine Shop*, v. 17, Jan. '45, pp. 190-192, 194.

One tool angle by itself does not describe the rake of a face mill cutting tooth, or of a lathe tool, unless that angle is the resultant of three components—radial rake, axial rake, and corner angle.

20-24. The Current Revolution in the Machining of Iron and Steel. *Machine Tool Blue Book*, v. 41, Jan. '45, pp. 187-188, 190, 200, 202, 204.

History and applications of the milling machine.

20-25. How to Select the Locating Surfaces in Designing Die Castings. *Die Casting*, v. 3, Jan. '45, pp. 18-19.

In the design of any casting that is to be machined, the experienced designer usually specifies one or more surfaces against which the casting is to be located when it is gaged and machined. If he fails to do so, there is always the chance that either the castings will not clean up properly when machined or that more machining than necessary will be done.

20-26. Wadkin 75-h.p. Heavy-Duty Wing-spar Milling Machine, Type L.Z.6. *Machinery* (London), v. 65, Dec. 21, '44, pp. 684-688.

With hydraulic clamping mechanism, pneumatic swarf collector and hydraulic profile-milling device.

20-27. Concerning the Installation of Automatic Lathes. K. Schwendenwein. *V.D.I. Zeitschrift*, v. 88, March 18, '44, pp. 155-159.

Detailed analysis of the work to be performed should be made to determine if the high first cost is justified.

20-28. Use and Care of Drills. I. F. A. *Aero Digest*, v. '44, Dec. 15, '44, pp. 99, 138.

Poor drilling has been the greatest single cause of scrap in the aircraft industry. This article is intended to provide some helpful hints on twist drills and drilling procedures as encountered by the aircraft mechanic in the average maintenance shop.

20-29. Modern Machine Tools. *Aircraft Production*, v. 7, Jan. '45, pp. 43-46.

Latest additions to the range of factory plant. Duplicating; profile-turning lathe; deep-hole drilling; heavy-duty turning.

20-30. Machining Airplane Engine Cylinder Heads. *Machinery* (London), v. 65, Dec. 28, '44, pp. 701-707.

Methods used in the production of the "Bristol" Hercules engine. The cylinder head comprises two parts, both of which are machined from castings.

21. LUBRICATION AND FRICTION; BEARINGS

21-1. Action of n-Primary Alcohols as Metal Cutting Fluids—Alternating Properties with Chain Length. Milton C. Shaw. American Chemical Society *Journal*, v. 66, Dec. '44, pp. 2057-2059.

An alternation in the cutting force required to remove a chip from an aluminum block at very low cutting speed is noted when successive normal, primary, monohydric alcohols are used as cutting fluids. Alcohols having an odd number of carbon atoms require lower cutting forces than the compounds having an even number of carbon atoms.

21-2. Water and Composition Roll Neck Bearings. J. P. Queeney. *Iron & Steel Engineer*, v. 21, Dec. '44, pp. 83-85.

Factors influencing the performance of composition bearings on roll necks. Water temperatures should not exceed 113° F.

21-3. The Manufacture of Grease. L. P. Lochridge. *Iron & Steel Engineer*, v. 21, Dec. '44, pp. 86-89.

Grease making has been lifted to a scientific procedure. Although accurate testing procedure is used to control grease manufacture, actual service tests must be the final criterion of application.

21-4. Engine Reconditioning. *Automobile Engineer*, v. 34, Dec. '44, pp. 523-529.

Production control system, and the question of under and over sizes for bearings. Equipment for cylinder reboring and crankshaft regrinding is dealt with. Reasons for adapting modifications given. Reference is made to rebabbitting equipment and the machines specially designed for boring bearings.

21-5. A New Experimental Approach to the Study of Boundary Lubrication. E. N. Dacus, F. F. Coleman and L. C. Ress. *Journal of Applied Physics*, v. 15, Dec. '44, pp. 813-824.

Apparatus for measuring the relative ability of rubbed-down mono layers of polar lubricants to maintain low friction under test conditions which do not permit replacement of the lubricant. This quality of a lubricant is called its "durability." The clean polished rim of a slowly rotating steel wheel rubs on the monolayer deposited on a polished steel flat.

21-6. Current Developments in Industrial Lubricants. G. F. Bowers. *Iron & Steel Engineer*, v. 22, Jan. '45, pp. 48-51.

Under the stress of war demands, developments in lubricants have proceeded rapidly. Many of the improvements will be of assistance in improving the economy of postwar operations.

21-7. Ford Develops Tri-Alloy Bearing. Leonard Westrate. *Automotive Industries*, v. 92, Jan. 15, '45, pp. 20-21, 96.

The new bearing will give from two to taree times the service life of conventional bearings, even under the most severe conditions. Another advantage is said to be its ability to stand up under heavy load at high speed operation. The tri-alloy material consists of 35 to 40% lead, 4½ to 5% silver, and the balance copper, with a trace of iron.

(Continued on Page 14)

A.S.M. Review of Current Metal Literature—*Continued*

21. LUBRICATION (*cont.*)

21-8. **Static and Clinging Friction of Pivot Bearings.** M. C. Hunter. *Institution of Mechanical Engineers,* v. 151, Dec. '44, pp. 274-282.
Distinction to be drawn between kinetic and static friction. Describes the special apparatus used to determine the static friction of various combinations of metals, including stainless steel and duralumin, under several conditions of dry and viscous lubrication.

21-9. **Piston-Ring and Cylinder Wear in Automobile-Type Engines.** P. V. Lamarque. *Engineering,* v. 158, Dec. 22, '44, pp. 497-500.
Summarized information which is normally somewhat scattered. Lubrication; scuffing.

21-10. **Testing Lubricants and Bearing Materials.** V. H. Brix. *Aircraft Engineering,* v. 16, Dec. '44, pp. 361-362.
Description of a useful Rolls-Royce testing machine.

21-11. **Investigation of Friction and Wear Under Quasi-Hydrodynamic Conditions.** R. G. Larsen and G. L. Perry. American Society of Mechanical Engineers *Transactions,* v. 67, Jan. '45, pp. 45-50.
Laboratory study of the factors which influence friction and wear by additive-containing mineral oils under conditions intermediate between those of hydrodynamic and true boundary lubrication. The concentration of a number of sulphur and phosphorus compounds required for minimum wear varies over a wide range. The minimum effective concentration is determined by the presence in the molecule of acidic groups which concentrate the additive at the wearing surfaces. Under the conditions of these experiments it appears that wear is predominantly a corrosion process.

21-12. **The Friction Properties of Various Lubricants at High Pressures.** John Boyd and B. P. Robertson. American Society of Mechanical Engineering *Transactions,* v. 67, Jan. '45, pp. 51-59.
In connection with certain problems associated with the manufacture and punching of laminated stock, an investigation was made of the friction properties of various special lubricants under high pressures. Results have been found useful in a number of special applications presented.

22. JOINING

Welding; Brazing; Flame Cutting; Riveting

22-1. **Welding Sectionally Cast Stern Frames.** *Iron Age,* v. 154, Dec. 28, '44, pp. 52-54.
Thermit welding on Victory ships; stern frames and bow sections on these ships furnished in sections. Bow stems welded; sections then placed on the welding slab and the ends burned to the proper length.

22-2. **Automatic Regulated Flux Supply Improves Silver Soldering Production Efficiency.** *Iron Age,* v. 154, Dec. 28, '44, p. 55.
New flux supply technique for silver soldering has practically eliminated the principal non-productive finishing operations. Process results in automatic supply of flux to the joint in the correct amount and at a uniform rate.

22-3. **Arc Welding Safety Factors.** R. F. Wyer. *Aero Digest,* v. 47, Dec. 15, '44, pp. 114-116, 229.
Discusses safety factors from the electrical point of view and shows definite ways by which the hazard can be almost completely overcome.

22-4. **Beryllium Copper Bellows with Leakproof Construction.** A. E. Ross. *Industry & Welding,* v. 17, Dec. '44, pp. 48-49, 51.
Leak-proof bellows construction depends on silver solder process.

22-5. **Blazing the Trail with Welded Construction—III.** *Industry & Welding,* v. 17, Dec. '44, pp. 39, 42-44, 47.
Extension arm assembly; mounting bracket assembly.

22-6. **Flash Welds.** *Automobile Engineer,* v. 34, Dec. '44, p. 534.
The quality of resistance in high-tensile steels.

22-7. **Arc Welded Cutting Alloys.** E. C. Rollason and P. Harris. *Metallurgia,* v. 31, Nov. '44, pp. 3-6.
Alloys of high hardness have many applications when deposited on tougher materials; they are applied where high hardness, high polish and low coefficient of friction and high abrasive resistance are required. Attention is especially directed to their application for cutting purposes and to their deposition by the arc welding method.

22-8. **The Quality of Resistance Flash Welds of High Tensile Steels.** F. Bollenrath and A. Cornelius. *Metallurgia,* v. 31, Nov. '44, p. 46.
Experiments were carried out with two chromium-vanadium alloy steels, one of which also contained molybdenum. Flash butt welds were carried out on an A.E.G. resistance welding machine employing a specific upset pressure of 5 kg. per sq. mm. over a travel of 4 to 7 mm. (*Luftfahrtforschung,* v. 21, no. 1, Feb. 28, '44, pp. 17-28.)

22-9. **Production in the Fabricating Shop.** F. Koenigsberger. *Welding,* v. 12, Dec. '44, pp. 532-539.
How to apply to the fabricating shop, in the case of high class welded products, machine structures, etc. Methods of inspection whose value for technical and economical efficiency in the machine and fitting shop has been established.

22-10. **A New Dressing Tool.** W. S. Simmie. *Welding,* v. 12, Dec. '44, pp. 540-541.
For the maintenance of electrode tips for spot welding machines.

22-11. **Naval Construction.** Stanley V. Goodall. *Welding,* v. 12, Dec. '44, pp. 542-546.
Application of welding.

22-12. **Steel Framed Houses.** *Welding,* v. 12, Dec. '44, pp. 547-550.
Use of spot welding in their fabrication.

22-13. **"Two-Tone" Arc Welding.** J. A. Cunningham. *Welding,* v. 12, Dec. '44, pp. 551-552.
Technique for rebuilding of worn surfaces. (Reprinted from *Iron Age.*)

22-14. **A Landing Has Been Made.** *Welding,* v. 12, Dec. '44, pp. 553-556.
Construction of invasion craft.

22-15. **Design of Welded Structures, I.** J. Corston MacKain. *Welding,* v. 12, Dec. '44, pp. 557-563.
Welding details of work on a factory building which was partly welded and partly riveted.

22-16. **Factors Controlling the Weldability of Steel.** L. Reeve. *Welding,* v. 12, Dec. '44, pp. 573-579.
American work on weldability of low alloy steels; Jominy tests; the bend tests; discussion of Doan and Stout's procedure; mechanically satisfactory joints; what are soft electrodes. 22 ref.

22-17. **Welding.** Frank J. Oliver. *Iron Age,* v. 155, Jan. 4, '45, pp. 83-85, 174, 176, 178, 180, 182.
Methods have been developed for welding the hardenable steels hitherto considered unweldable. Some answers have been found as to the behavior of metals under triaxial stress and metallurgical deterioration that takes place as a result of arc welding.

22-18. **Arc Welding Metal-Cutting Tools to Save High-Speed Steel.** *Machinery,* v. 51, Jan. '45, pp. 178-181.
Methods developed for the maintenance of high-speed steel cutting tools and the conservation of tungsten used in their manufacture. Abstract of an article entered in the James F. Lincoln Arc Welding Foundation Award Program by H. W. Rushmer.

22-19. **Deep Fillet Welding.** R. V. Anderson. *Steel,* v. 116, Jan. 8, '45, pp. 86-88, 128.
Increases welding footage two to three-fold; affords savings in electrode consumption of about one-third; employs predetermined angle, travel rate, and amperage.

22-20. **Destructive Effect Indicates Caution in Use of High-Temperature Solders for Fine Copper Wire.** *Steel,* v. 116, Jan. 8, '45, pp. 102, 105, 133-134.
While conducting tests that resulted in the finding of a new method for clean-stripping Formex type insulation from fine wire (sizes No. 36-44), Fairchild engineers explored this phenomenon, and worked out a preventive.

22-21. **Laminating Steel and Cupronickel.** J. V. Kielb. *Steel,* v. 116, Jan. 8, '45, pp. 114, 116, 118.
Process for super-cladding header plates for motor-generator sets and similar applications where vibration puts laminated assemblies to severe test accomplished by combining single mild steel plate with two lesser thicknesses of cupronickel. Copper binder and hydrogen brazing make good bond.

22-22. **Joint Design for Silver-Brazing Non-Ferrous Metals.** *Oxy-Acetylene Tips,* v. 24, Jan. '45, pp. 5-8.
Suggestions regarding the design of joints that are to be made by silver-brazing. Joints in copper; thin film; tank and container heads; operating temperatures.

22-23. **How to Make Cutting Machine Templets.** *Oxy-Acetylene Tips,* v. 24, Jan. '45, pp. 9-13.
Templet base material; principles of templet layout; attaching the templet strip; care of templets.

22-24. **Thermit Welding in Heavy Fabrication.** Kenneth Rose. *Metals & Alloys,* v. 20, Dec. '44, pp. 1620-1624.
Nature and utility of thermit welding; describes its engineering applications in the heavy-fabrication field.

22-25. **Welding Fabrication.** J. A. Dorratt. *Steel Processing,* v. 30, Dec. '44, pp. 785-787, 805.
Guillotine for straight cutting; flame-cutting machine is used for the profile work. Advantage of these methods lies in the reduction in the amount of plate distortion resulting in cutting. Machines available in a variety of forms and suitable for repetition work from templates or for tracing individual shapes from a drawing. Multi-jet machines cut the contours but also the plate edge preparation at the same time. (Abstract of paper presented to the Institute of Marine Engineers.)

22-26. **Wire Stitched Lap Joints in Aluminum Alloy Sheet.** MacDonald Sill. *Product Engineering,* v. 16, Jan. '45, pp. 38-39.
Zinc-coated steel wire staple joints in aluminum sheet give satisfactory results in salt spray test for corrosion resistance, and in pull strength and vibration tests. Long service records also show wire stitching is suitable for many joints.

22-27. **Screws with Recessed Heads Test Stronger than Slotted Type.** T. R. Rieben and C. J. Spengler. *Product Engineering,* v. 16, Jan. '45, pp. 46-48.
An investigation to determine why countersunk headscrews when used in lap joints fail at less than calculated load. Causes of failures are analyzed and a method of determining the allowable load developed. Slotted head screws are found to fail at lower loads than recessed head screws, the position of the slot in relation to the direction of load having considerable effect on the load-carrying ability of slotted head screws.

22-28. **Metlbond Adhesive for Metals.** G. G. Havens and H. R. Jenks. *Iron Age,* v. 155, Jan. 18, '45, pp. 62-64, 136.
By combining two adhesives, one having a synthetic rubber base and the other a plastic base, Consolidated Vultee developed a high strength bonding agent for metals and non-metals that can be cured under low pressure in inexpensive jigs.

22-29. **Special Cutting Set-Up Aids War Production.** H. R. Gettys. *Industry and Welding,* v. 18, Jan. '45, pp. 37-39.
Adroit use of ingenious equipment to speed a cutting operation.

22-30. **Blazing the Trail with Welded Construction.** G. S. Storatz. *Industry and Welding,* v. 18, Jan. '45, pp. 40-41, 69.
Outlines type of construction by which it is possible to get a cylinder which has the inside bore held to a high degree of precision even though some of welding is done after finish machining.

22-31. **Welding for Glass Lined Construction.** W. G. Degray. *Industry and Welding,* v. 18, Jan. '45, pp. 44-46, 52, 54, 56-60, 62-63.
In the fabrication of such glass-lined equipment it is very necessary that the weld deposition be of the highest quality regardless of the welding process used. To attain this quality, it is advantageous to use any technique or process that will result in a deposition that is free of porosity, inclusions, gas pockets, cold-shuts, or any other imperfections.

22-32. **The Effect of Plate Width on Fabrication Costs of Boilers, Tanks and Pressure Vessels.** W. G. Theisinger. *Industry and Welding,* v. 18, Jan. '45, pp. 48-49, 89-94.
The designer's problem is to find that combination of width extras, and fabricating operations, which produces the lowest cost of construction.

22-33. **Controlled Quality Workmanship.** Robert Burnett. *Industry and Welding,* v. 18, Jan. '45, pp. 64-68.
Operational data for the welder for improved quality work.

22-34. **Spot Welding Aluminum.** *Industry and Welding,* v. 18, Jan. '45, p. 73.
Thorough cleaning is the only way yet found to prevent undue tip wear, excessive pick-up of metal on the tip, lack of uniform weld strength, and the occurrence of cracks in the weld buttons.

22-35. **Arc-Welded Engine Mountings.** *Aircraft Production,* v. 7, Jan. '45, pp. 27-31.
Production of Avro-Lancaster sub-frames.

22-36. **Trends in Design of Weldments.** Edward J. Charlton. *Machine Design,* v. 17, Jan. '45, pp. 135-142, 192.
Incorporating castings in weldments; operating efficiency increased; utilizing rolled steel; effects of battle action on weldments; basic component is hot-rolled plate; utilizing drop-forged components.

22-37. **1944—Production Reaches Peak.** T. B. Jefferson. *Welding Engineer,* v. 30, Jan. '45, pp. 35-37.
Though the production of war material has not slumped, a leveling off from the peaks of the past year is apparent. The welding industry continues to make progress in research. Among the most promising of the new developments are multiarc welding, electronically controlled flame-cutting and storage-battery resistance welding.

22-38. **Fabrication Cost vs. Width.** W. G. Theisinger. *Welding Engineer,* v. 30, Jan. '45, pp. 40-43, 64.
To build the shell of a pressure vessel, answer to which is more economical—a one-piece fabrication of a wide plate or a two-piece fabrication of narrower plates.

22-39. **Welded Railroad Rails.** *Welding Engineer,* v. 30, Jan. '45, pp. 44-47.
Continuous rail offers a big market for welding in the postwar world. Flash-welded rail and equipment that is needed to produce it.

22-40. **Welding With Aluminum Bronze.** Roy Norton. *Welding Engineer,* v. 30, Jan. '45, pp. 48-51.
Aluminum-bronze electrode has an enormous capacity for tackling tough jobs. It is used in both maintenance work and original fabrication, for both welding and hard facing.

22-41. **Bucking the Buckling.** Arthur H. Brown, *Welding Engineer,* v. 30, Jan. '45, pp. 52-53.
Can be done successfully by keeping in mind the fundamentals: (1) Expansion and contraction will occur wherever heat is applied to metal; (2) there is also the likelihood of distortion or warpage if the heated metal is restrained from its normal movement.

22-42. **Robot Bombs Made by Welding.** T. B. Jefferson. *Welding Engineer,* v. 30, Jan. '45, pp. 54, 56, 58.
Ninety days after fragments of the V-1 flying bomb had been salvaged in England, U. S. engineers had produced a complete working model. Technical facts uncovered regarding Hitler's no-longer-secret weapon.

22-43. **Methods of Joining Aluminum-Alloy Products.** E. C. Hartmann, G. O. Hoglund and M. A. Miller. American Society of Mechanical Engineers *Transactions,* v. 67, Jan. '45, pp. 1-21.
Clarifies procedures that have become established for making joints in these alloys. Discussion includes the common practices of riveting, welding, brazing, soldering, and a promising new possibility, resin-bonding.

22-44. **Flash Welding SAE 4130 Steel Tubing.** Walter Pestrak and W. W. Ackerman. *Iron Age,* v. 155, Jan. 25, '45, pp. 46-49.
SAE 4130, with NE 8630, has distinguishing characteristics which make it particularly desirable as an aircraft steel, such as excellent strength-weight ratio, good weldability and high tensile strength with good impact resistance. Practical considerations relating to the flash welding of this material presented.

22-45. **Optimum Plate Width Determination in Fabricating Pressure Vessels.** W. G. Theisinger. *Iron Age,* v. 155, Jan. 25, '45, pp. 56-59, 149.
Method applicable to tanks, boilers and pressure vessels of dissimilar shapes presented which enables the fabricator to make a quick comparison of the cost of welding vs. plate width extras.

22-46. **Jigs and Fixtures for Welding.** A. N. Kugler. *Welding Journal,* v. 24, Jan. '45, pp. 5-12.
Jigs and fixtures should be as simple as is consistent with the requirements of the problem. They should be rugged and substantial without being excessively heavy. They must be strong enough to hold the component parts in the desired positions not only when cold but also when heat of welding is applied. (Presented at the Twenty-Fifth Annual Meeting, American Welding Society, Cleveland, Oct. 16 to 19, '44.)

22-47. **New Silver Soldering Technique Improves Production.** C. A. Medsker. *Welding Journal,* v. 24, Jan. '45, pp. 22-23.
Development of a new technique for the use of silver solder and other low melting point alloys in production has practically eliminated the principal non-productive finishing operations that have been common-place steps of procedure in numerous plants. The essence of the improvement is the automatic supply of flux to the joint in the correct amount and at a uniform rate.

22-48. **Recent Applications of Oxy-Acetylene Processes in Steel Foundries.** G. E. Bellew. *Welding Journal,* v. 24, Jan. '45, pp. 25-35.
Machine cutting; scarfing; gouging; flame descaling; flame heating.

22-49. **Welding of Locomotives for Main Line Operation.** *Welding Journal,* v. 24, Jan. '45, pp. 45-50.
Electric welding proved itself superior to other methods of construction in many industries and now it is rapidly earning a good acceptance in the railroad industry for one of the most important jobs of all—rolling stock. (Presented at the Twenty-Fifth Annual meeting, American Welding Society, Cleveland, Oct. 16-19, '44.)

22-50. **Normalizing of Welds in Carbon-Molybdenum Steel Pipe by 60-Cycle Induction Heating.** D. H. Corey and I. A. Rohrig. *Welding Journal*, v. 24, Jan. '45, pp. 1s-6s.

Presents the results of tests carried out on a 14-in. O.D. 0.937-in. wall thickness carbon-molybdenum pipe on which local normalizing was accomplished with 60-cycle stress-relieving equipment, and includes the results of a metallographic examination showing the microstructure of samples cut from various locations in the pipe. (Presented at the Twenty-Fifth Annual Meeting, American Welding Society, Cleveland, Oct. 16-19, '44.)

22-51. **Flash-Butt Welding — Welding Technique and Variables in Welding Low-Alloy Steels.** J. J. Riley. *Welding Journal*, v. 24, Jan. '45, pp. 12s-24s.

Flashing action; nature of the flashing action; energy input during the flashing action; electrical consideration in the flashing action; the flashing action as observed from measurements of electrical quantities; secondary voltage and load voltage; procedure for setting variables that control the flashing action; the nature of the upsetting action; platen force versus upset velocity; upset velocity; measurement of upset variables; upset current; post-heating current; application of flash-butt welding. 4 ref.

22-52. **Flash Welding of Alloy Steels — Physical and Metallurgical Characteristics.** J. C. Barrett. *Welding Journal*, v. 24, Jan. '45, pp. 25s-44s.

Alloy steels, with their higher hardenability and their more complex nature, provide a host of new problems to the welding engineer, particularly since alloy steel flash welded parts are often subjected to high stresses in service. Some of the problems which arise in the flash welding of alloy steels are considered and an attempt is made toward the solution of the problems.

22-53. **Problems in Spot Welding of Heavy Mild Steel Plate.** F. R. Hensel and E. F. Holt. *Welding Journal*, v. 24, Jan. '45, pp. 46s-57s.

Investigation carried out to determine certain weld characteristics with respect to welding conditions and electrode design. Conventional a.c. resistance welding equipment was employed in all tests. 9 ref.

23. INDUSTRIAL USES AND APPLICATIONS

23-1. **Control of Tool Production and Maintenance.** F. Cook. *Machinery* (London), v. 65, Nov. 23, '44, pp. 576-580.

Tool room system. Control of tool manufacture; tool-room work performed elsewhere; tool maintenance; stock tools.

23-2. **Vale Die Set and Stripper.** *Machinery* (London) v. 65, Nov. 23, '44, pp. 581-584.

Die set which minimizes tool-making work, while retaining the desirable features of pillar-type tools, and provides for interchangeability of the punches and dies.

23-3. **Disc Brakes.** *Automobile Engineer*, v. 34, Dec. '44, p. 529.

A variety of types for light or heavy vehicles.

23-4. **New Tanks for Old Ones.** *Modern Industrial Press*, v. 6, Dec. '44, pp. 9-10.

In a thoroughly modern factory, where not so many months ago deft, sleek machines poured out and packaged millions of rounds of small arms ammunition, towering cranes and frames today go about one of the most fascinating jobs that the war has produced—that of rejuvenating and rebuilding worn and damaged tanks for battle service.

23-5. **Wire Woven Belt Production.** *Wire Industry*, v. 2, Dec. '44, pp. 615, 618.

Ideal driving medium; forming the wire spirals; applying the surface contact material.

23-6. **Indium in Aviation.** William S. Murray. *Aircraft Engineering*, v. 16, Nov. '44, pp. 332-333.

Decorative finishes; brazing alloys; bearings; new indium alloy coating approved for use on steel airscrew blades; process used in factory; preparation of surface for paint used as camouflage following application of indium alloy coating; advantages of indium alloy coatings. (Paper read at 12th Meeting of the Institute of the Aeronautical Sciences, New York, 1944.)

23-7. **Light Alloys in Rectifiers, Photocells and Condensers.** *Light Metals*, v. 7, Dec. '44, pp. 565-566.

Detailed consideration of the theory and practice of electrolytic condensers.

23-8. **Light Alloys in Civil Engineering.** *Light Metals*, v. 7, Dec. '44, pp. 582-606.

The value of light alloys in immobile structures lies in the high strength-to-weight ratio of these materials; their resistance to corrosion and decay; the readiness with which they respond to certain fabricating operations; and the ease, compared with bricks, concrete, ferrous and other non-ferrous metals, of transportation to the site and of handling during erection.

23-9. **Exacting Production Methods on the Aircraft Gyropilot.** G. A. R. *Machinery* (London), v. 65, Nov. 30, '44, pp. 589-597.

The A-3 Sperry gyropilot is composed of two separate control units called the "gyrohorizon" and the "directional gyro." Exacting methods of machining, assembly, and inspection employed in manufacturing these units described and illustrated.

23-10. **Design of Hydraulic Systems.** Howard Field. *Product Engineering*, v. 16, Jan. '45, pp. 22-26.

Description and analysis of the characteristics, advantages, limitations, and control of the output of types of pumps suitable for use in hydraulic systems. Pumps of the following types are discussed: Centrifugal, gear, vane, and piston.

23-11. **Malleable Castings for Heavy Duty Trucks.** Pat Dwyer. *Foundry*, v. 73, Jan. '45, pp. 68-71, 206.

New foundry operated by Saginaw Malleable Iron Division, General Motors Corp., at Tilton, Ill.

23-12. **Mass Production in Ship-Building.** Howard Campbell. *Modern Machine Shop*, v. 17, Jan. '45, pp. 124-132, 134, 136, 138.

Methods employed by the California Shipbuilding Corporation in the building of Liberty and Victory Ships.

23-13. **Complete Assembly of 57-Mm. Gun Carriages by Pressed Metal Producer.** *Steel Processing*, v. 30, Dec. '44, pp. 780-782.

Production of end-products by stampers is the complete 57-mm. anti-tank gun carriage M1A3 made by the Parish Pressed Steel Co. Assembly steps shown.

23-14. **Some Applications of Welded Aircraft Tubing.** J. S. Adelson and Park Hill. *Steel Processing*, v. 30, Dec., '44, pp. 806-808, 816.

Applications of welded tubing in the power plant. (Presented at annual meeting of American Society of Mechanical Engineers, New York City, Dec. 1, 1944.)

23-15. **Cast Iron Thread Gages.** C. C. Taggart. *Metals & Alloys*, v. 20, Dec. '44, pp. 1607-1610.

Use and performance of the cast iron gages and some of the machining, heat treating and other operations in their manufacture.

23-16. **Gray Iron. . . . Its Economy, Adaptability and Versatility Viewed as an Engineering Material.** R. G. McElwee. *American Foundryman*, v. 7, Jan. '45, pp. 12-16.

Cooperation between the designing engineer and the foundryman can greatly influence the future use of cast iron as an engineering material.

23-17. **Hercules Sleeve-Valve Engine Production.** *Machinery* (London), v. 65, Dec. 7, '44, pp. 617-625.

The sleeve-valve system of operation, with its smooth continuous sliding motion, replaces the poppet valve system with its multitude of parts and continuous hammer-and-anvil action. The special steel sleeve valve, with its four ports, is positively driven from the crankshaft at half engine speed by an arrangement of simple cranks and gears. A cutaway view of one of the cylinder units, showing the crank-driven sleeve, is given.

23-18. **Tipped High Speed Steel Widely Used, Survey Shows.** Frank J. Oliver. *Iron Age*, v. 155, Jan. 18, '45, pp. 58-61, 137-140.

When the supply of alloying elements for high speed steel became critical, many methods of using this cutting tool material in tip rather than solid form were publicized. To discover to what extent these practices have actually been put to work in industry, a survey was conducted, the results of which are summarized.

23-19. **German Radiators, Oil Tanks and Coolers.** *Aircraft Engineering*, v. 16, Dec. '44, pp. 363-368.

DO 18/D3 Jumo 205C engine—Aluminum oil cooler; Messerschmitt 109F, Mercedes-Benz engine—Aluminum radiator; Junkers 88, Jumo 211 engines—Radiators; Focke Wulf 200 (Condor) B.M.W. engines—Oil cooler; Focke Wulf 200 Condor engine—Oil tank; Radiator unit from Me 210.

23-20. **The Utilization of Engineering Constructional Steels.** E. Simister. *Metallurgia*, v. 31, Dec. '44, pp. 65-69.

Significant metallurgical developments have been made in recent years in the production and utilization of engineering constructional steels. Wartime requirements have necessitated the utmost conservation of steel and all steel-making material, involving a rather drastic conversion to planned economy. Metallurgical progress has facilitated rationalization of steel usage. the advantages of which may insure the retention of its principles, under more normal conditions, for economic reasons alone.

23-21. **Metallurgical Progress in Tin.** John Ireland. *Metallurgia*, v. 31, Dec. '44, pp. 75-79.

Search for, and use of, substitutes and alternatives which scarcity enforces may well serve to bring out the advantages of previously established usage. This is exemplified in such uses of tin as tinplate, solder and bronze, in which recent experience suggests that future progress will be the result of intelligent development of previously established practice.

23-22. **Zinc and Zinc Alloys.** B. D. Darrah. *Metallurgia*, v. 31, Dec. '44, pp. 87-91.

Outlines some of the chief uses of zinc and zinc alloys during the war years; applications of zinc; zinc die-casting alloys; zinc alloy for press dies; molds for plastic molding.

23-23. **Light Metals Versus Plastics.** Ronald Fleck. (*Light Metals*, v. 7, no. 82, Nov. '44, pp. 518-521.) *Engineers' Digest* (American Edition), v. 2, Jan. '45, pp. 40-41.

Comparison of the two industries to discover the essential differences and boundaries.

23-24. **Rapid Production of Finned Tubes.** A. G. Arend. *Machinery* (London), v. 65, Dec. 21, '44, pp. 689-690.

Discussion of various methods.

23-25. **Utilizing the Effects of Cold Setting in Springs.** A. M. Wahl. *Machine Design*, v. 17, Jan. '45, pp. 107-112.

Cold setting has proved advantageous in increasing the life of springs for many types of applications. Analysis of actual spring shows that the reduction of peak stresses may be substantial and indicates why high working stresses may be used in design. 9 ref.

23-26. **Aircraft Bevel Gears.** *Aircraft Production*, v. 7, Jan. '45, pp. 13-18.

Review of types and their applications; design and production considerations.

23-27. **Tolerance for Molded-Plastic Screw Threads.** J. Butler. *Machinery* (London), v. 65, Dec. 28, '44, pp. 713-717.

Difficulties of mating screw threads molded in plastics with metal threads have long been recognized by plastic molders and tool-makers. Modern molding powders, made under controlled conditions, give a shrinkage which for a given grade of powder is constant within reasonably fine limits, so that it is possible to make provision for the shrinkage by cutting mold threads oversize in both diameter and pitch if equipment for cutting non-standard pitch threads is available.

23-28. **Woven Wire Conveyor Design, Part II.** Fred L. Hooper. *Industrial Heating*, v. 12, Jan. '45, pp. 51, 52, 54, 56.

Design, construction, maintenance and operation of industrial woven-wire conveyor belts discussed, with reference to the influence of types of materials from which belts are made, belt construction, and other operating details upon belt life. The steps that can be taken to increase belt life in a given use by adopting various alloy materials to construct belts for specific purposes discussed. The numerous ways in which conveyors can be installed are described and actual installation views are shown to indicate the wide applicability of this mode of handling material during processing of practically all forms of materials.

23-29. **Paid.** Ray Anderson. *Die Castings*, v. 3, Jan. '45, pp. 24, 44, 46.

Judicious use of die castings reduces weight of perforating machines.

23-30. **Get Out of the Way.** R. D. Buell. *Die Casting*, v. 3, Jan. '45, pp. 28, 30.

Use of die castings for high pressure horns.

23-31. **Slow Down.** C. B. Seymour. *Die Casting*, v. 3, Jan. '45, pp. 31-33.

An assembly of die cast parts provides a trouble free, tamper proof governing device.

23-32. **Stop Master.** G. L. LaBar. *Die Casting*, v. 3, Jan. '45, pp. 42-43, 57.

Die castings stand up under severe weather and road conditions; in brake assemblies for the Russian army the ultimate practical test of ruggedness is met.

23-33. **What Torque?** W. C. Stewart. *Fasteners*, v. 1, no. 4, '44, pp. 8-10.

Torque-tension ratio is an important factor in many applications of fasteners—friction gremlins, opposing efforts to produce tension, make this ratio an uncertain quantity.

23-34. **Field Welded Pressure and Variable Volume Storage Tanks.** Fred L. Plummer. *Welding Journal*, v. 24, Jan. '45, pp. 37-45.

In selecting the proper type of large field welded container in which to store a given product, one must consider four major factors: (1) Safety from fire or explosion; (2) maintaining the quality of the product; (3) preventing loss of the product—breathing, filling and boiling losses; (4) cost of initial installation, maintenance and operation. 6 ref.

24. DESIGN

24-1. **"Blue Printing" on Metal.** H. J. Christy. *Metal Progress*, v. 47, Jan. '45, p. 94

Methods available for direct printing of full scale inked drawings from tracing paper or linen.

24-2. **Pre-Production Technique.** H. G. Barnett. *Aircraft Production*, v. 6, Dec. '44, pp. 575-579.

Full-scale layout and template reproduction; application of Robinson A. C. T. Process.

24-3. **Analysis of Unbalanced Forces in Multicylinder Gear Drives.** Sergei G. Guins. *Product Engineering*, v. 16, Jan., '45, pp. 40-43.

Investigation of rotating and reciprocating forces present in a mechanism consisting of single cylinder units mounted around and driving a common spur gear. Test observations and oscillograph pictures confirm conclusions deduced from summations of moment and force equations referred to the center of the system.

24-4. **Drawing Office Practice in Die Design.** H. K. and L. C. Barton. *Machinery* (London), v. 65, Nov. 30, '44, pp. 607-610.

Standardization of practice in drafting by giving the production departments only one set of conventions with which to familiarize themselves, has a marked effect in reducing the liability of error of misinterpretation during die construction. Adoption of British Standard recommendations effects closer relationship of drafting practice with the practical requirements of the production departments.

24-5. **"Edge-Up" Forming Dies.** C. W. Hinman. *Steel Processing*, v. 30, Dec. '44, pp. 788-790.

Unusual design of a forming die that produces many variations of long sectional shapes from sheet steels and other sheet metals. Forms certain shapes that cannot be done on a press brake in one operation, unless this die is used. Application of the old hinge-pin principle.

24-6. **Photographic Reproduction for Aircraft Layout.** *Machinery* (London), v. 65, Dec. 7, '44, pp. 631-635.

Preparation of layout blanks; layout section; processing.

24-7. **Specifying Rational Tolerances for Interchangeability, Low Cost.** F. A. Wedberg. *Machine Design*, v. 17, Jan. '45, pp. 117-122.

Tolerances in design; many phases of engineering involved; closer collaboration required; tolerances in a machine-part assembly; factors applying to control-surface tabs.

24-8. **Bevel Gears as Applied in Lightweight Designs.** L. J. O'Brien. *Machine Design*, v. 17, Jan. '45, pp. 147-152.

Factors affecting bevel gear selection; checking tooth strength; new design data forthcoming; curvic spline couplings and clutches. (Abstract of a paper presented at the National Aeronautic Meeting of the Society of Automotive Engineers in Los Angeles.)

24-9. **Pre-Production Technique.** *Aircraft Production*, v. 7, Jan. '45, pp. 38-42.

Photographic scale reproduction of original full-scale layouts. Equipment and procedure.

24-10. **Truss Design.** *Steel*, v. 116, Jan. 22, '45, pp. 110-112.

Puts all web members in vertical plane to eliminate gusset plates and facilitate assembly.

24-11. **Cost Analysis in a Product Redesign.** Cecil L. Wilder. *Die Casting*, v. 3, Jan. '45, pp. 34-39.

The proper approach to an analysis of total costs should be based on a per unit breakdown. Often great disparity between two preliminary cost figures of two different methods of fabrication may prove to be more apparent than real. Article is based on conditions peculiar to one manufacturer, but the principle might well be considered more often in cost analysis work.

24-12. **Design Rules—Part 10.** Herbert Chase. *Die Casting*, v. 3, Jan. '45, pp. 50-52, 54-55.

When two or more parts commonly made separately and subsequently assembled, are involved, study the possibility of producing these units as a single die casting.

24-13. **Mathematical Basis for the Design of Cutting Tools for a Milling Machine.** Condensation by B. W. Heise. *V.D.I. Zeitschrift*, v. 88, Feb. 19, '44, p. 100.

24-14. **Design of Dies for Rubber-Die Press Work.** *Machinery* (London), v. 65, Dec. 28, '44, pp. 709-712.

Points of importance in designing the tools: Edges of the die should be given as large a radius as possible to obviate cracking of the blank; die should be at least ¼ in. deeper than the flange which is to be formed; to allow for springback, a backing angle of approximately 4° may be provided on the side faces of the die; provision should be made for location pins with large-diameter mushroom heads to position the blank from selected tooling holes.

24-15. **Drawing Office Practice in Die Design.** H. K. and L. C. Barton. *Machinery* (London), v. 65, Dec. 28, '44, pp. 722-725.

Die construction methods; sprue holes; inserts; hand-operated cores.

24-16. **Design of Welded Machinery.** John Mikulak. *Welding Journal*, v. 24, Jan. '45, pp. 13-21.

There are many inherent characteristics of the welding art which require special consideration and sets it apart from other forms of fabrication.

A.S.M. Review of Current Metal Literature — *Continued*

25. MISCELLANEOUS

25-1. **The Organization of Experimental Research.** W. G. Radley. *Engineering*, v. 158, Nov. 24, '44, pp. 416-417.
The materials of the future will appear, mostly, as the logical end products of experiments carried out to obtain fundamental knowledge of the relationship between the atomic and molecular structure of materials on the one hand, and their electrical and mechanical properties on the other.

25-2. **Power Circuit Breakers.** H. F. Hentschel and E. W. Boehne. *Iron & Steel Engineer*, v. 21, Dec. '44, pp. 74-82.
New types of breakers operate on advanced principles of circuit interruption, giving industry safe equipment which eliminates some application and maintenance problems.

25-3. **Applied Research.** H. R. Ricardo. *Aircraft Engineerng*, v. 16, Nov. '44, pp. 324-325.
Emphasis on the importance of quality in research personnel as compared with lavish expenditure on equipment.

25-4. **The Organization of Experimental Research.** W. G. Radley. *Engineering*, v. 158, Dec. 8, '44, p. 445.
Stresses importance of interchange of manufacturing, operating and research activities. Comprehensive library and effective information service, essential features of any large research organization.

25-5. **Design of Post-War National Employment Services for Professional Engineers and Scientists.** W. H. Pitcher. *Canadian Chemistry & Process Industries*, v. 28, Dec. '44, pp. 815-817, 819.
British plan; relationship to other government employment offices; special considerations from the standpoint of the national economy.

25-6. **Engineers of Tomorrow.** Robert M. Gates. *Mechanical Engineering*, v. 67, Jan. '45, pp. 5-8, 69.
Our leadership in engineering education; broader views of engineers' responsibilities; proposals for redirection and expansion of engineering education.

25-7. **Mass Production Line Tooled for Flexibility.** *Tool Engineer*, v. 15, Jan., '45, pp. 78-88.
Connecting rods and rod caps; plant layout; crankshaft line; camshaft line.

25-8. **Organize for Efficient Production.** Joseph V. Kielb. *Tool Engineer*, v. 15, Jan., '45, pp. 92-93.
A smooth production operation depends upon good organization. In turn, this demands a balanced division of responsibilities. Proposes an approach to the problem by defining the duties and inter-relationship of production engineering, production control, time study, and industrial relations.

25-9. **Alternating Current Control Systems for Overhead Cranes.** C. B. Risler. *Steel*, v. 116, Jan. 15, '45, pp. 104, 107, 108, 126, 128.
Because of the almost universal usage of alternating current, this discussion will be helpful in selecting controls and drives.

25-10. **Magnesium Fires Controlled With Sprinklers.** *Iron Age*, v. 155, Jan. 18, '45, p. 65.
Control of incipient fires; good housekeeping.

25-11. **Magnitogorsk at War.** V. Dudadevsky. *Iron & Steel*, v. 17, Dec. 7, '44, pp. 750-752.
Extension of the great Russian steelworks in the Urals.

25-12. **The Electronic Frequency Changer.** F. W. Cramer, L. W. Morton and A. G. Darling. *Iron & Steel Engineer*, v. 22, Jan. '45, pp. 52-67.
Useful tool now available for certain applications previously using other types of equipment. Describes an installation in daily use as an interconnection between 60-cycle and 25-cycle power systems.

25-13. **Aluminum Grommet Remover.** *Aero Digest*, v. 47, Dec. 15, '44, pp. 98-99.
By using the simple tool described, a fastener can be removed in approximately 20 sec. This is a tremendous time saving over older methods and the tool will do the job with little trouble, leaving no scars on the structure.

25-14. **Industrial Diamonds.** P. Grodzinski. *Aircraft Production*, v. 7, Jan. '45, pp. 3-6.
Properties and selection for special purposes. (Abstract from a lecture presented to Imperial College Chemical Society, South Kensington, Nov. 3, '44).

25-15. **Scanning the Field for Ideas.** *Machine Design*, v. 17, Jan. '45, pp. 103-106.
Electronic timing; gear cutting; spindle drive; pneumatic charger, hermetically sealed relay; induction coils, changing of engines on attack bombers.

26. STATISTICS

26-1. **Steel Industry Faces Adjustment Problems.** J. D. Knox. *Steel*, v. 116, Jan. 1, '45, pp. 194-197.
Scrapping of uneconomical open-hearth furnaces expected after war. Intensive sales effort needed to keep electric furnace capacity occupied. Study being given methods of beneficiating low-grade ores. Part of cost of many new basic metal plants probably can be charged off to cost of making war.

26-2. **Automobiles.** A. H. Allen. *Steel*, v. 116, Jan. 1, '45, pp. 198-199.
Automotive industry faces reconversion task of first magnitude, but management has advantage of experience gained in switching over to annual new models.

26-3. **Shipbuilding.** W. J. Campbell. *Steel*, v. 116, Jan. 1, '45, pp. 202-203.
United States, with two-thirds of world's merchant ship tonnage, will cut back construction sharply after the war. Eight hundred thousand tons annually generally believed top figure for postwar years. Disposal of surplus vessels and yards poses large problem.

26-4. **Agriculture.** Erle F. Ross. *Steel*, v. 116, Jan. 1, '45, pp. 204-205.
Farm machinery industry expected to start at end of European war on a several-year period of sharply expanded production, exploration of new markets for new products, and extremely keen competition. Reconversion will be relatively easy because prewar facilities are intact.

26-5. **Railroads.** Erle F. Ross. *Steel*, v. 116, Jan. 1, '45, pp. 206-207.
Carriers hope to receive sufficient steel to make overdue improvements and modernization during 1945. Wartime service has been outstanding despite shortages of equipment. Past year's freight traffic has been double 1940; passenger travel four times 1940 load.

26-6. **Containers.** L. E. Browne. *Steel*, v. 116, Jan. 1, '45, pp. 208-209.
Tin plate production expected to increase during 1945, but must await end of war and freeing of Straits supply of tin before output attains prewar levels. Substitutes necessitated by war unlikely to be retained when coating metal again becomes available in quantity.

26-7. **Appliances.** R. L. Hartford. *Steel*, v. 116, Jan. 1, '45, pp. 210-211.
Home appliance industry, completely converted to war production, faces difficult task in resuming civilian output. Many new companies will enter field. Postwar costs, particularly labor, are expected to be higher.

26-8. **Construction.** L. E. Browne. *Steel*, v. 116, Jan. 1, '45, pp. 212-213.
Huge construction volume awaits relaxation of wartime controls on manpower and materials. Need seen for million residential units yearly. Structural steel fabricators wondering to what extent tremendous advance in wartime welding can be utilized in postwar economy. Engineers differ in opinions.

26-9. **Machine Tools.** Guy Hubbard. *Steel*, v. 116, Jan. 1, '45, pp. 214-215.
Disposition of excess machine tools at end of war is one of gravest problems facing builders. Government will own approximately 500,000 tools, of which 100,000 will be retained for security purposes, leaving 400,000 surplus.

26-10. **Machinery and Equipment.** Guy Hubbard. *Steel*, v. 116, Jan. 1, '45, pp. 216-217.
Some heavy metalworking equipment continues in "critical" category. Many long-standing traditions in design, construction and use have been brushed aside by war developments.

26-11. **British Steel Industry Looks Ahead to Peacetime.** J. A. Horton. *Steel*, v. 116, Jan. 1, '45, pp. 304-305, 353-355.
Peak of war production passed early in 1944. Change in steel's position indicated by drop in semifinished imports and exportation of plates. Wartime controls are expected to be relaxed gradually.

26-12. **Domestic Market Summary.** G. H. Manlove. *Steel*, v. 116, Jan. 1, '45, pp. 308-309, 347-348.
Steel output in 1944 sufficient to fill war demands. Regulation of production and delivery easier than in earlier war years. Numerous strikes and general manpower shortage prevented full utilization of expanded facilities.

26-13. **Steel, 1944.** Tom Campbell. *Iron Age*, v. 155, Jan. 4, '45, pp. 55-59.
After working itself into a comfortable mid-year position, the steel industry is again entering a period of schedule improvising, maintenance difficulties, delayed deliveries, sudden shifts in military requirements, and an impending series of labor demands.

26-14. **War Production.** Hiland G. Batcheller. *Iron Age*, v. 15, Jan. 4, '45, pp. 61-63, 196.
With 1945 now scheduled as a two-war year the available supplies of many essential war metals again are critical. Extreme pressure on wire mill products is to be expected; and brass strip, rod, and tube requirements exceed available facilities and manpower.

26-15. **Non-Ferrous Metals.** Charles T. Post. *Iron Age*, v. 155, Jan. 4, '45, pp. 65-67, 184, 186, 188, 190, 192.
Germany's lost grip on stolen resources premonishes disaster. Meanwhile, as America suffers serious depletion of its rich reserves, the brakes are slammed on the bulk of current domestic production to avoid a stockpile avalanche that will depress postwar markets.

26-16. **Transportation.** Jack R. Hight. *Iron Age*, v. 155, Jan. 4, '45, pp. 77-81, 180D-180F.
Railways continue to bear up under an unprecedented traffic load. Meanwhile, development trends in transportation—land, sea, and air—indicate a distinct trend toward simplified propulsive systems for more economical operation in the postwar era.

26-17. **Machine Tools.** Frank J. Oliver. *Iron Age*, v. 155, Jan. 4, '45, pp. 87-89, 180H, 193.
New demands for munitions plus Russian buying plus a rush for reconversion made machine tool orders take a second upturn at year's end. Reverses in Europe may end recent surge of unrated orders and discussions of surplus machine tool disposal problems.

26-18. **Foundry.** J. Albin. *Iron Age*, v. 155, Jan. 4, '45, pp. 91-95.
Mechanization, physical plant improvement, and testing and process control are the means by which foundrymen expect to secure a quality postwar product in competition with other practices and, at the same time, offset the dwindling pool of workers.

26-19. **Prices and Production.** John Anthony. *Iron Age*, v. 155, Jan. 4, '45, pp. 119-121, 148, 150, 152, 154, 158, 160, 162, 164, 166, 168, 170, 172.
The production of metal products has reached astounding peaks during the war but prices have been stabilized. However, open-hearth grades of scrap dropped below ceilings near the end of August, after which open market fluctuations have reflected supply and demand.

26-20. **Nickel Production in 1944 Less Than Last Year Because of Labor Shortage in Mines.** Robert C. Stanley. *Metals*, v. 15, Dec. '44, pp. 6-7.
Entire output of metal went into war material for the United Nations; steel industry continued to be largest consumer; post-war supply outlook is called favorable.

26-21. **Large Expansion Predicted in Electrolytic Tin Plate Use When Restrictions Are Ended.** J. C. Whetzel. *Metals*, v. 15, Dec. '44, pp. 12-14.
Process now accounts for one-quarter of entire output of tin plate and has saved 20,000,000 lbs. of metal.

26-22. **More Copper and Zinc Needed for Stepped up Munitions Program; WPB Tightens Hold on Lead.** *Metals*, v. 15, Dec. '44, pp. 18-20, 28.
FEA permits larger exports of bonded copper to South America; MRC stockpile of lead being greatly reduced.

26-23. **Gray Iron in the Postwar Period.** Donald J. Reese. *Foundry*, v. 73, Jan. '45, pp. 85, 220, 222, 224, 226.
Measures required of the foundry industry if it is to improve its competitive position after the war. (Paper presented before annual meeting of the Gray Iron Founders' Society.)

26-24. **West Awaits Decision on Future of War-Born Metalworking Capacity.** Robert Bottorff. *Steel*, v. 116, Jan. 8, '45, pp. 76-78.
New steel mills, scores of fabricating works, foundries and machinery plants raise hopes of westerners for industrial structure firmly established on heavy manufactures. Many market studies are under way.

26-25. **Developments in the Iron & Steel Industry During 1944.** W. H. Burr. *Iron & Steel Engineer*, v. 22, Jan. '45, pp. 80-92.
Material prepared by the A.I.S.E. Development Committee. Blast furnaces; steelmaking; rolling mills; finishing; furnaces and control; materials handling; mechanical developments; electrical developments.

26-26. **A History of the Iron and Steel Industry.** F. C. Farrell. *Iron & Steel Engineer*, v. 22, Jan. '45, pp. 99-104.
Evidence of the industry's influence on the industrial, economic, political, and social development of nations and of the world.

26-27. **Iron Ore in 1944.** M. D. Harbaugh. *Blast Furnace & Steel Plant*, v. 33, Jan. '45, pp. 69-76.
Scrap situation in relation to ore; the Lake Superior District; research activities; new developments on the ranges; Canadian Lake Superior operations; other districts; Southern and Western.

26-28. **Steel Production in 1944.** W. O. Philbrook. *Blast Furnace & Steel Plant*, v. 33, Jan. '45, pp. 119-126.
Production in 1944; electric furnace capacity; metallurgical developments; steelmaking practice; future trends. 5 ref.

26-29. **Tungsten Saga.** *Business Week*, Jan. 6, '45, pp. 28, 30, 32.
The industry in America has expanded threefold to meet war needs. New uses sought to maintain postwar demand.

27. NEW BOOKS

27-1. **Vakuumtechnik in Laboratorium.** Günther Mönch. 218 pp., illus. (Glasenstrumentenkunde, v. 3). J. W. Edwards Brothers, Ann Arbor, Mich. $5.00.

27-2. **Vakuumspektroskopie.** Hans Bomke. 248 pp., illus. J. W. Edwards Brothers, Ann Arbor, Mich. $4.65.

27-3. **Elektrische Isolierstoffe; ihr Verhalten auf Grund der Ionenadsorption an Inneren Grenzflachen.** Paul Boning. 134 pp., illus. J. W. Edwards Brothers, Ann Arbor, Mich. $3.00.

27-4. **Die Metallurgie des Eisens.** Robert Durrer. 3rd ed., 1034 pp., illus. J. W. Edwards Brothers, Ann Arbor, Mich. $30.00.

27-5. **Optische Pyrometrie.** Fritz Hoffmann and Carl Tingwaldt. 134 pp., illus., J. W. Edwards Brothers, Ann Arbor, Mich. $3.60.

27-6. **Lehrbuch der Metallkunde; Chemie und Physik der Metalle und ihrer Legierungen.** Gustav Tammann. 4th ed., 536 pp., illus., J. W. Edwards Brothers, Ann Arbor, Mich. $12.00.

27-7. **Das Holz als Rohstoff; seine Entstehung, stoffiche Beschaffenheit und chemische Verwertung.** Rheinhard Trendelenburg. 435 pp., illus., J. W. Edwards Brothers, Ann Arbor, Mich. $7.75.

27-8. **Bauelemente des Flugzeuges.** Herbert Wagner. 2nd ed., 295 pp., illus., J. W. Edwards, Ann Arbor, Mich. $4.50.

27-9. **Die chemische Analyse in der Stahlindustrie.** Robert Weihrich. 3rd ed., 244 pp., illus. (Chemische Analyse, v. 31), J. W. Edwards Brothers, Ann Arbor, Mich. $7.25.

27-10. **Werkstoff Magnesium.** 2nd ed. 164 pp., illus., J. W. Edwards Brothers, Ann Arbor, Mich. $3.20.

27-11. **Hochfrequenz-Meistechnik.** Otto Zinke. 223 pp., illus. (Physik und Technik der Gegenwart; Abtlg.; Fernmeldetechnik, v. 3). J. W. Edwards Brothers, Ann Arbor, Mich. $6.20.

27-12. **The Aeronautical Dictionary.** Thomas A. Dickinson. 494 pp., illus., diagrs. Crowell Publishing Co., New York. $3.50.
Definitions of over 6000 terms in aerodynamics, meteorology, navigation, piloting, engineering, metallurgy, design, lofting, and aircraft construction. Some of the definitions are those of the National Advisory Committee for Aeronautics. Illustrated with photographs and with drawings by James D. Powell.

27-13. **Electrical Drafting Applied to Circuits and Wiring.** D. Walter Van Giesen. 148 pp., illus., diagrs., McGraw-Hill Book Co., New York. $1.50.
A textbook in drawing wiring plans, in terms of the finished electrical installation.

27-14. **Care and Use of Hand Tools.** Edited by William C. Lewis. Raymond R. Toliver. 100 pp., illus., diagrs., John Wiley & Sons, New York. $1.25.
A handbook for mechanics and students on how to handle and care for tools so they will last longer and give better service.

27-15. **Airframe Materials.** F. S. Stewart. 248 pp., illus., diagrs., McGraw-Hill Book Co., New York. $2.50.
An introductory textbook on the materials, metals, woods, plastics, that are used in the construction of airplanes.

27-16. **Questions and Answers for Airplane and Engine Mechanics.** Compiled and edited by Aviation Research Associates in cooperation with the technical staffs of the Academy of Aeronautics and the Casey Jones School of Aeronautics. 513 pp., illus., McGraw-Hill Book Co., New York. $4.00.
An aviation mechanic's guide in question and answer form, covering the aircraft maintenance and repair practice information which the student or apprentice mechanic must know to pass the Civil Aeronautics Administration examinations.

(Continued on Page 17)

Employment Bureau

Address answers care of American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio, unless otherwise stated. Applicants for the positions listed below are required to observe the rules and regulations of the War Manpower Commission regarding a statement of availability, if employed in an essential activity.

Positions Open

INDUSTRIAL FURNACE SALES ENGINEER: Exclusive territory arrangement on straight commission basis for sales engineer familiar with industrial heat treating processes. Bulalo territory now available. Old, well-established company. Box 2-5.

METALLURGICAL ENGINEER: As sales manager for a large well-established mid-west manufacturer of machines for physical testing of metals. Requirements include basic knowledge of mechanical engineering and metal-working methods together with some sales experience in similar or heavy machinery line. Send outline of qualifications to box 2-10.

METALLURGISTS: One ferrous and one non-ferrous (brass and bronze); also one electrical engineer. For large manufacturing plant near New York City. College degree necessary; two to five years' experience desired. These positions have essential war ratings, will continue through postwar period, and have advancement opportunities. Salaries, while not war-inflated, are equal to or above that paid by stable industries. Kindly submit qualifications, together with minimum salary desired. Box 2-50.

SALES ENGINEER: Experience in furnace design and construction, for large national manufacturer of insulating refractories and refractory specialties. Excellent postwar opportunities. Write in detail giving age, draft status, experience and salary requirements. Box 2-55.

METALLURGICAL ENGINEER: Graduate with nine years of diversified supervisory experience in production control, process and development and research. Desires chief metallurgist or supervisory position with postwar future. Minimum salary $5,000. Box 2-60.

ENGINEERS: Experienced mechanical and electrical engineers and engineers experienced in machine design and sheet metal products. Only top successful men in their fields should apply. Entire output of company devoted to manufacture of over 300 war items. Address confidential applications to Lawrence A. Harvey, Vice-President, The Harvey Machine Co., Inc., 6200 Avalon Blvd., Los Angeles 3, Calif.

PHYSICAL METALLURGIST or chemical engineer with training and experience in physical metallurgy: A man is needed who can take responsible charge of a research and development project for a company engaged in important war production. The position also has excellent post-war possibilities. The applicant should be about 30 to 35 years of age, have a broad working knowledge of metallic materials, physical testing methods, and some knowledge of chemical metallurgy. Write Engineering Experiment Station, University of Tennessee, Knoxville 16, Tenn.

TECHNOLOGISTS: For federal service. Electrochemical and process metallurgical fields among the vacancies, which exist in Washington, D.C. and throughout the country in such agencies as the War and Navy Departments, Department of Agriculture and Department of the Interior. Salary range from $2433 to $6288. Minimum of three years' experience required unless appropriate education is substituted. No age limits. Detailed announcements available from nearest post office or from the U.S. Civil Service Commission, Washington 25, D. C.

Positions Wanted

HEAT TREATING FOREMAN: Amibitious young man would like supervisory position in a heat treating plant. Good references; excellent background. Experienced in high frequency induction hardening and new salt bath methods. Steady and reliable. Draft exempt. Free to move. Box 2-35.

HEAT TREATER: 15 years' experience, specializing in high speed steel, various types of tool steels and spring steel. Wide experience in carburizing and forgings. Age 35. Ambitious and willing worker, possessing initiative. Box 2-40.

METALLURGIST: Employed since 1941 as chief metallurgist of large magnesium producer. Considerable consultant experience with principal magnesium and light alloy foundry and casting plans and with west coast aircraft industry. B.S. in metallurgical engineering 1926; M.S. 1932; graduate study in chemistry and physics. Box 2-45.

ASSISTANT METALLURGIST: Metallurgical graduate; four years' experience in metallurgical control, supervision in large plant engaged in all types of heat treating, forging and machining. Desires position with definite postwar assurances. Box 2-15.

CHIEF OF CHEMICAL RESEARCH: For large manufacturing company handling metallurgical, plating, lacquers and enamel, laundry, textile and analytical problems, will be available Feb. 1. Experienced in organizing and setting up spectrographic, metallographic, physical testing and research chemical laboratories. A metropolitan area desired. Box 2-20.

PHYSICAL METALLURGIST: 42, D. Sc., with nine years of diversified industrial experience and six years' university experience. Patents and publications. Experience includes research, development, supervision of and planning for metallurgical laboratory. Desires connection in supervisory capacity with university or research organization with postwar assurance. Box 2-25.

EXCLUSIVE AGENCIES: In France, for U. S. producers of metals and metallic salts for chemical industry. Located in Paris, age 46; 25 years' experience in this business. Can offer all advantages and guarantees required. Box 2-30.

HEAT TREATER: Operating position wanted with company in San Diego or Los Angeles area doing hydrogen annealing. Two years' experience in this special work with one of the largest commercial heat treaters in the country. Two years as metallurgical observer in large steel mills and also temperature control experience in forge division of Dodge Chicago Plant. Good education; best of references. Box 2-65.

CHAPTER MEETING CALENDAR

CHAPTER	DATE	PLACE	SPEAKER	SUBJECT
Baltimore	Mar. 19	Engineers Club	H. B. Osborn, Jr.	Induction Heating—at War Today, at Peace Tomorrow
Birmingham District	Mar. 13		E. E. Thum	Some Thoughts on the Influence of Air Power on Future History
Boston	Mar. 2	Hotel Sheraton	A. W. Merrick	Precision Castings
British Columbia	Mar. 13	Hotel Georgia, Vancouver, B. C.		National President's Night
Buffalo	Mar.		F. G. Tatnall	Tools for Postwar Physical Testing
Calumet	Mar. 13	Phil Smidts, Hammond, Ind.	W. O. Owens	Fuels and Furnaces
Canton-Massillon	Mar. 8	Elks Club, Canton	J. O. Almen	Effect of Residual Stresses on the Fatigue Strength of Metals
Cedar Rapids	Mar. 13	Hotel Roosevelt	Ralph Aikens	Aluminum Castings
Chicago	Mar. 8	Chicago Bar Assoc.	V. N. Krivobok	Stainless Steels for Aircraft
Cincinnati	Mar. 8	Engineering Society	Carl A. Zapffe	Gas-Metal Systems
Cleveland	Mar. 5	Cleveland Club	A. T. Colwell	What's Ahead in the Aircraft Industry
Dayton	Mar. 7	Engineers Club	J. O. Almen	Shot Peening
Detroit	Mar. 12	Rackham Bldg.	Walter Bonsack	Alloys Affecting Aluminum
Eastern New York	Mar. 13		M. Gensamer	Relationships Between Microstructure and Properties of Steel
Fort Wayne	Mar. 27	Chamber of Commerce	George K. Dreher	Non-Ferrous Metals
Georgia	Mar. 5	Duchess Coffee Shop, Atlanta		Prepared Atmospheres—Carburizing, Nitriding, Cyaniding
Hartford	Mar. 13	Hartford Electric Light Co.	Peter Payson	The Annealing of Steel
Indianapolis	Mar. 19	Y. W. C. A.	W. E. Ellsworth	Modern Temperature Measurement and Control
Inland Empire	Mar. 12	Davenport Hotel	K. R. Van Horn	Heat Treatment of Aluminum Alloys
Kansas City	Mar. 28	Pickwick Hotel	H. J. Babcock	Electrode Type Salt Baths
Lehigh Valley	Mar. 2	Hotel Bethlehem	H. B. Osborn, Jr.	Induction Heating
Los Angeles	Mar. 22	Scully's Cafe	Kent Van Horn	Precipitation Hardening
Mahoning Valley	Mar. 13	Dinner Bell, Youngstown, Ohio		Plastics
Manitoba	Mar. 8	Marlborough Hotel, Winnipeg	J. M. Mills	Case Hardening
Milwaukee	Mar. 20	Milwaukee Athletic Club	F. D. Bowman	Higher Production and Greater Precision Through Grinding
Montreal	Mar. 7	Queen's Hotel	C. B. Larrabee	Corrosion of Steel in the Atmosphere and in Sea Water
Muncie	Mar. 14	Masonic Temple, New Castle, Ind.	Karl Keller	Electronics
New Haven	Mar. 15	Connecticut Light and Power Co. Waterbury	R. W. Thompson	New Developments in Ferrous and Non-Ferrous Forging Practice
New Jersey	Mar. 19	Essex House, Newark	B. F. Shepherd	Martempering and Related Processes
New York	Mar. 12	2 Park Ave., 26th floor	B. F. Shepherd	Martempering
North West	Mar. 21	University of Minnesota	A. Allan Bates	Plastics vs. Metals
Notre Dame	Mar. 14	Engineering Audit., Univ. of Notre Dame	H. W. Dietert	Spectrographic Analysis of Metallurgical Materials
Ontario	Mar. 2	King Edward Hotel, Toronto		Ladies' Night
Oregon	Mar. 15		K. R. Van Horn	Application of the Aluminum Castings and Wrought Alloys
Ottawa Valley	Mar. 6	Lecture Hall, National Museum	A. E. Cartwright	Foundry Light Alloys
Philadelphia	Mar. 23	Engineers Club	A. E. Schuh	Centrifugal Castings
Pittsburgh	Mar. 8	Roosevelt Hotel		Young Fellows' Night
Puget Sound	Mar. 14	Washington Athletic Club	K. R. Van Horn	Age Hardening of Metals
Rhode Island	Mar. 7		F. L. LaQue	Corrosion
Rochester	Mar. 12	Lower Strong Auditorium, University of Rochester	J. D. Corfield	Precision Casting of Carbon and Stainless Steel
Rockford	Mar. 21	Faust Hotel	A. P. Seasholtz	Martempering, Salt Baths and Heat Treatment of Steel
Rocky Mountain				
Pueblo	Mar. 15	Vail Hotel	J. O. Almen	Fatigue of Metals
Denver	Mar. 16	Oxford Hotel	J. O. Almen	Fatigue of Metals
Saginaw Valley	Mar. 20	Bancroft Hotel, Saginaw, Mich.	Peter Payson	Modern Methods of Annealing Steel
Springfield	Mar. 19	Sheraton Hotel	R. W. Thompson	New Developments in Ferrous and Non-Ferrous Forging Practice
St. Louis	Mar. 16	York Hotel	E. G. Mahin	Physical Testing
Syracuse	Mar. 6	Onondaga Hotel	E. H. Dix, Jr.	Alminum Alloys
Texas	Mar. 20	Texas State Hotel, Houston	G. K. Dreher	Bronze
Toledo	Mar. 28	Toledo Yacht Club	Ralph Wilson	Intensifiers
Tri-City	Mar. 13	Hotel Ft. Armstrong Rock Island, Ill.	F. G. Tatnall	New Developments in Testing Equipment
Warren	Mar. 8	100F Hall, Warren, Ohio		
Washington	Mar. 12	Dodge Hotel	H. B. Osborn, Jr.	Induction Heating—at War Today, at Peace Tomorrow
West Michigan	Mar. 19	Rowe Hotel, Grand Rapids	L. G. Klinker	Corrosion Prevention of Metals
Worcester	Mar. 14	Sheraton Hotel	A. H. d'Arcambal	Tool Steels and Tool Heat Treatment
York	Mar. 14	Lancaster, Pa.	H. J. Babcock	Electrode Type Salt Baths

27. NEW BOOKS (*cont.*)

27-17. Adsorption. Charles Letnam Mantell. 394 pp., illus., diagrs., McGraw-Hill Book Co., New York. $4.50.

A correlation of the practical, commercial, and engineering aspects of adsorption.

27-18. Production Engineering in the Aircraft Industry. A. B. Berghell. 318 pp., diagrs., McGraw-Hill Book Co., New York. $3.00.

A textbook which is the outgrowth of courses on production engineering and aircraft statistics taught by the author under the Engineering, Science and Management War Training Programs at the University of Southern California and the University of California at Los Angeles.

27-19. High-Frequency Induction Heating. Frank W. Curtis. 243 pp. illus., diagrs., McGraw-Hill Book Co., New York. $2.75.

For the manufacturing executive and technician.

27-20. Milling Machine Operations. Lewis E. King. 132 pp., illus., diagrs., Macmillan Publishing Co., New York, Paper, $1.75.

27-21. Production-Line Technique. Richard Muther; foreword by Erwin Haskell Schell. 329 pp., illus., diagrs., McGraw-Hill Book Co., New York. $3.50.

The author made his observations first as an operator on various production lines, then as a technical staff assistant, and lastly as an analyst of a large number of production lines in Detroit and elsewhere.

27-22. Vibration Analysis. N. O. Myklestad. 316 pp., diagrs., McGraw-Hill Book Co., New York. $3.50.

Suitable for a first course in mechanical vibrations for the engineering student who has a knowledge of mechanics and strength of materials and also to show the advanced student and practical engineer how problems of practical importance can be solved by relatively simple means.

27-23. The Testing of High Speed Internal Combustion Engines. Arthur W. Judge. 3rd ed., 462 pp., illus., D. Van Nostrand Co., New York. $16.00.

27-24. Dictionary of Engineering and Machine Shop Terms. A. H. Sandy. 153 pp., Chemical Publishing Co., Inc., 26 Court St., Brooklyn 2, N. Y. $2.75.

Definitions in clear and simple language useful not only for engineers and students of engineering but also for foremen and specialized workmen.

Technical Societies Cancel Conventions

Spring meetings of technical societies cancelled recently in conformity with the Washington directive to curtail conventions and meetings include the 1945 War Production Foundry Congress of the American Foundrymen's Association, scheduled to be held in Detroit April 30 to May 4; the general meeting of the American Iron and Steel Institute, customarily held in New York City in May; the Tool Engineering Industrial Planning Exposition of the American Society of Tool Engineers, Cleveland, March 19 to 23: the 25th annual meeting of the Copper and Brass Research Association on May 17; the 47th annual meeting of the American Ceramic Society, Buffalo, April 15 to 19.

27-25. A Primer of Electronics. Don P. Caverly. 235 pp., illus., McGraw-Hill Book Co., 330 West 42nd St., New York 18. $2.00.

Beginning with the atom, the electron, and static and electron discharges, goes step by step through explanation of electric current, magnetism, and electromagnetic radiation to an understanding of simple radio tubes, fluorescent lamps, cathode ray tubes, ignitron, thyratron, and other tubes and their basic connections for practical purposes.

27-26. Aluminum—An Industrial Marketing Appraisal. Nathanael H. Engle, Homer E. Gregory, and Robert Mosse. 480 pp., illus., Richard D. Irwin, Inc., 332 S. Michigan Ave., Chicago 4. $6.00.

An exhaustive report on the postwar outlook for aluminum. Factors of aluminum production; the aluminum industrial structure; aluminum markets; recommendations for public policy.

27-27. Practical Design for Arc Welding, Volume 2. Robert E. Kinkead. 100 welding design plates, The Hobart Brothers Co., Hobart Square, Troy 1, Ohio. $3.50.

100 design ideas with particular attention to fabrication of tubular members and connections. For use by designers, engineers and fabricators.

27-28. New Methods for Sheet Metal Work. W. Cookson. 207 pp., diagrs., 3rd ed., The Technical Press, Ltd., Gloucester Rd., Kingston Hill, Surrey, London, England.

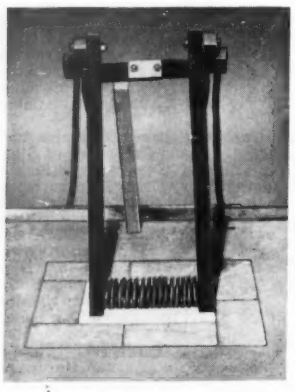
A practical working textbook for apprentices, sheet metal workers, platers and draftsmen engaged in engineering, aircraft, shipbuilding and other industries.

NEW PRODUCTS IN REVIEW

STARTING COIL ELIMINATES SALT BATH FREEZE-UP

Upton Electric Furnace Division
7450 Melville, Detroit 17, Mich.

Freeze-ups of electric salt bath furnaces no longer require extensive time and trouble in starting up when a new electric salt bath furnace coil introduced by this company to "unfreeze" salt baths is used.



This new starting coil consists of a nichrome heating coil element connected to the output leads of the furnace transformer by two mild steel bars and flexible buses, and operates in conjunction with the transformer. Thus, no additional equipment is required and the time required to place the coil in operation is negligible. The coil can be used either before or after the salt in the furnace is allowed to freeze up. When the furnace is to be shut down, the coil is dropped into the salt bath so that it reaches the bottom of the pot. The power can then be cut and the furnace allowed to freeze up. The leads are connected to the transformer and the power turned on when it is desired to start the furnace again. With both the starting coil and the normal heat from the electrodes themselves, the salt is melted down in a short time, after which the starting coil is removed and the furnace is ready for use.

When the salt has been allowed to freeze up solid without the starting coil having been placed in the bath, the salt at the top of the pot is chipped away to provide a nest for the coil and the starting coil is placed in the nest as illustrated. Loose salt is poured into the depression and around the coils until the latter are about half covered. The leads of the starting coil are connected with the transformer and the power is turned on. Melting of the salt from this point on is entirely automatic, requiring no further attention. As the salt at the top melts, the coil gradually works downward, melting the frozen salt as it descends.

Mention R767 When Writing or Using Reader Service.

OILITE EXPANDS CORED AND BAR LINE

Amplex Division, Chrysler Corp.,
6501 Harper Ave., Detroit 11, Mich.

Several dozen new sizes of cored and solid bar stock in Oilite materials have been announced by this Division.

The new sizes embrace a range of ⅜ in. to more than 12 in. in diameter. Important advantages of the Oilite bar stock are the features of self-lubrication and greater load carrying capacities. Although Oilite differs from cast materials in that it is made from metal powders and impregnated with oil, the cored and bar pieces are machined just like a cast bearing. Some of the largest units are illustrated above and a complete stock size list is now available in a new booklet.

Mention R768 When Writing or Using Reader Service.

MERCURY ARC CONVERTER FOR INDUCTION HEATING APPLICATIONS

Allis-Chalmers Manufacturing Co., Milwaukee, Wis.

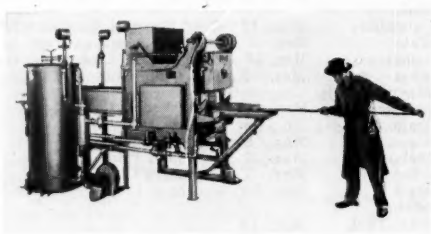
Development of a new mercury arc converter which fills out the low frequency range of electronic equipment required in the field of induction heating applications is announced by this company. Designed for the purpose of electronically changing power at commercial frequencies of 60 or 25 cycles into 1000 to 2000 cycle power, the mercury arc type of frequency changer is particularly suitable for supplying power for forging, melting, and metal treating applications where large masses of metal or metal parts must be efficiently heated with this power at kilowatt capacities of 250, 500, 1000 and higher.

Two highly successful applications of the new converters have been made in the past year, one being a 300-kw. unit in a forge plant, and the other a 250-kw. unit in use in the melting section of a brass foundry. The units are quiet in operation and require no ventilation or air filtering since they are water-cooled. This mercury arc converter completes this company's line of electronic type induction heating equipment since it is also building equipment for the higher frequencies.

Mention R769 When Writing or Using Reader Service.

ALL-PURPOSE BRAZING FURNACE

Lindberg Engineering Co.,
2444 West Hubbard St., Chicago 12, Ill.



Wartime applications of brazing and powder metallurgy forecast many short cuts in fabricating peacetime products, short cuts that will make a big difference in meeting postwar competition, this company points out in announcing a new all-purpose furnace to meet the need for the most modern and efficient production equipment.

The furnace is designed for silver brazing at low temperatures, copper brazing at high temperatures, powder metallurgy, bright annealing, general tool hardening and high speed tool hardening. Unusual flexibility of use results from its wide range of attainable working temperatures—from 1300 to 2500° F.

The construction of this new furnace permits the handling of heavy loads at high temperatures, making its use especially efficient for the sintering of powdered metals where each piece may weigh as much as several hundred pounds. Also, handling work in and out of the furnace has been made easier by the use of the efficiently designed loading and unloading platforms. Furnace shutdowns are forestalled by the use of Globar type heating elements that are quickly and easily replaceable.

Hydryzing atmosphere, precombusted gas and dry hydrogen atmosphere may be used for prevention of oxidation and discoloration, insuring work that is bright and clean. The furnace is protected from infiltration of outside air by the use of a flame curtain at both the charge and discharge doors of the furnace. The curtain ignites automatically when the doors are opened. This is a further protection against oxidation. A gas-tight, water-cooled cooling chamber is filled with the proper atmosphere to prevent oxidation and discoloration during cooling. Full information is available in a new booklet.

Mention R770 When Writing or Using Reader Service.

INSPECTION OF FERROUS MATERIALS

Allen B. DuMont Laboratories,
2 Main Ave., Passaic, N. J.

Simple comparisons of ferrous materials as to analysis and heat treatment are provided by the Ferrograph, a new metal testing instrument. It can provide highly useful information about iron and steel very rapidly, just as its larger and more elaborate counterpart, the Cyclograph, is available for a wider range of tests on nonferrous as well as ferrous materials.

Using the transformer principle of operation, a 23-cycle exciting current is fed into the primary coil while the output of the secondary is controlled by the magnetic characteristics of a metal sample introduced into the coil. Voltage from the secondary is filtered and the fundamental 23-cycle wave is impressed on the horizontal axis of the cathode-ray tube. The third harmonic is viewed on the vertical axis of the instrument.

The first and third harmonics will vary in phase and amplitude with variations in the analysis and heat treatment of steel or iron. Sorting of commonly used S.A.E. steels is quite practical although in some cases the difference obtained is very small and may not be sufficient for sorting production lots of parts. About 80% of the mixtures of two types of iron or steel that can occur, can successfully be sorted by the Ferrograph. Calibrated scale provides ten divisions per inch, with the tenth division accentuated. The instrument operates on 115 volts, 40 to 60 cycles.

Mention R771 When Writing or Using Reader Service.

JOMINY SPECIMEN HOLDER

Claud S. Gordon Co., 3000 So. Wallace St., Chicago 16, Ill.

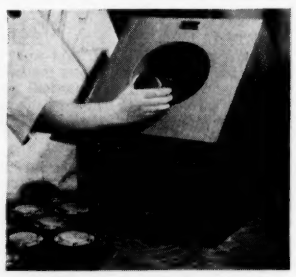
This new specimen holder for making Jominy end-quench hardenability tests consists of a stainless steel shell with a cap. The specimen to be tested is put inside the shell and heated in any furnace. After heating, the shell is placed in the base assembly. The pin in the bottom of the base pushes up the specimen, causing the cap to fall off. The sample may then be readily removed with the special Jominy tongs and quenched in the special Jominy tank. These two items are also made by Gordon. It is said that this new holder simplifies the making of tests and prevents scaling.

Mention R772 When Writing or Using Reader Service.

NEW LINE OF DEMAGNETIZERS

General Electric Co., Special Products Division,
Schenectady, N. Y.

A new line of demagnetizers for completely demagnetizing magnetically soft materials, such as common irons and steels, and partly demagnetizing permanent magnets such as Alnico is announced by this company. The line is designed to demagnetize tools, drills, and punches to prevent excessive heat and wear caused by the adherence of magnetic chips. The demagnetizers are also desirable for demagnetizing various machined parts, thus releasing fine adhering particles which often cause severe wear and impair accuracy and appearance. In addition, they can be used to adjust and stabilize the magnetic flux in permanent-flux assemblies for such applications as electric instruments and control devices.



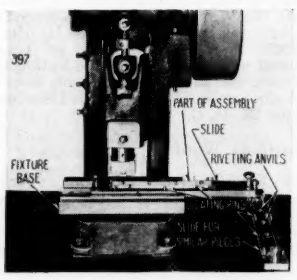
Consisting of a cylindrical air-core coil, mounted in a sturdy stand at a convenient 45° angle, these demagnetizers are available in a 4-in. size, rated 115 volts, 60 cycles, a.c., and in 8 and 12-in. sizes, rated 220 and 440 volts. Long flexible leads for connection to the power line are furnished with the 4-in. size, while a small connection box behind the coil of the larger sizes accommodates standard electric conduit. In operation, rated voltage is applied and the material to be demagnetized is either passed directly through the coil or placed in its center and slowly withdrawn about 2 ft. along its axis. At that point the magnetic field is negligible, and the material is then demagnetized. For continuous operation, non-metallic conveyor belts can be run through the coil, provided the parts being demagnetized are neither in metal containers nor in contact with each other, so as to cause shielding.

Mention R773 When Writing or Using Reader Service.

RIVETING FIXTURE

Westinghouse Electric and Mfg. Co.,
306 Fourth Ave., Pittsburgh 30, Pa.

This illustration shows a bench type punch press at the Sunbury plant of Westinghouse on which is mounted a riveting fixture that facilitates assembly when many rivets are located in various positions on a common center line.



The base of the fixture is fixed on the press table; nested in the base, directly under the center of the punch, is a ball bearing backed up by a spring. The bottom side of the slide is counterbored under each rivet location so that, as the slide is moved, the ball bearing rises into a counterbore and locates the assembly in a riveting position. A riveting anvil is mounted on the slide at each rivet position. Locating pins on the slide position the pieces.

The operator makes the assembly and places it in the fixture. As the assembly is moved towards the left it is located in the first riveting position by the ball bearing rising into the counterbore. The press is then operated and the rivet is headed; this is repeated until the assembly is completely riveted. The punch serves a two-fold purpose—it presses the parts of the assembly together before riveting to insure a tight fit, and then it heads the rivet. In the lower right hand corner is shown a slide made for parts similar to the one in the press. A complete fixture need not be built for each job because slides for various jobs may be built for use in a common base.

Mention R774 When Writing or Using Reader Service.

SOLID POLISHING WHEELS

Norton Company, Worcester, Mass.

A line of solid polishing wheels are to be marketed under the trade name Norflex. Available in three types, cork resinoid, fiber resinoid and resilient rubber, they make it possible to meet the special requirements of a wide range of de-burring, finishing and polishing operations. These are jobs which not so long ago were performed by hand filing, scraping and sanding.

All three types of Norflex abrasive wheels and sticks are similar in that they possess a relatively soft and flexible bond that imparts a cushion-like action, assuring a smooth uniform finish. They differ from conventional grinding wheels in that they are designed to remove only a relatively small amount of material such as a burr or sharp edge or to polish a surface that is all ready to size rapidly and economically.

Mention R775 When Writing or Using Reader Service.

NEW PRODUCTS IN REVIEW

INDUSTRIAL POWER TUBE

Federal Telephone and Radio Corp.,
32 Central Ave., Newark 1, N. J.

A new compact power tube, first in a series especially designed for industrial use in high frequency heating equipment, has been developed and designated F-5303. It is supplied with 6-in. flexible copper leads permanently secured to the tube terminals. This feature eliminates the glass damage frequently encountered by industrial users in attaching and adjusting terminal clamps on the tube itself, and permits installation and maintenance by inexperienced personnel.

Some of the other outstanding design features of this tube are its unusually sturdy, conservatively spaced filament and grid elements, and an absence of ceramic insulation, both internal and external. These qualities make it ideally suited for use in electronic heating equipment that must withstand the shocks and vibration commonly encountered in manufacturing plant operations. Rated at 3500 watts input, this power tube operates at full ratings at frequencies up to 50 megacycles. Over-all height of the tube is approximately 7 in. with a maximum diameter of 3½ in. This particular model is designed for forced-air cooling, but can be supplied for water cooling in model F-5302.

Mention R776 When Writing or Using Reader Service.

PROTECTIVE COATING FOR SPRAY BOOTH SIDEWALLS

Detrex Corp., 13005 Hillview Ave., Detroit 27, Mich.

Triad PR is a new protective coating for the sidewalls of both wet and dry spray booths. With this new coating between the walls and the layer of overspray that normally builds up, quick and easy cleanup is obtained. The booth so protected is stripped clean simply by spraying with water or steam; the Triad PR and accumulated paint flush off together. In dry booths which have no drainage facilities, the protective coating greatly facilitates scraping off the paint. The coating can be applied by either brush or spray gun. It gives excellent coverage, and dries to a hard, white, dustless coating which improves visibility in the booth.

Mention R777 When Writing or Using Reader Service.

MASTER SERIES GAGE BLOCKS

Continental Machines, Inc., Minneapolis 4, Minn.

This new DoAll Gage Set No. 118 is designed as a master series of gage blocks, capable of producing any combination of sizes required in precision measurements. This master series is said not only to provide for more duplicate combinations of the same size, but makes possible the widest range of combinations of any gage set on the market.

The series serves for several distinct applications. It is well represented by so-called thin blocks. These blocks range in size from 0.010 to 0.090 in. and include a thin block series in steps of ten one-thousandths of an inch from 0.010 to 0.090 in. A second thin block series in steps of one one-thousandth of an inch is from 0.021 to 0.029 in. A third thin block series in steps of one ten-thousandth of an inch runs from 0.0201 to 0.0209 in.

This series is well represented by standard gage sizes, the first series being in steps of one ten-thousandth of an inch from 0.1001 to 0.1009 in. The next series is in steps of one one-thousandth of an inch running from 0.101 to 0.149 in. The fifty-thousandths series covers all sizes from 0.100 to 0.950 in., and the inch series runs from 1.000 to 4.000 in., inclusive.

Another point is that with the measuring systems based on fractions, a series of three fractional size gages, $\frac{1}{32}$, $\frac{1}{64}$, and $\frac{1}{128}$ in., combined with six of the standard blocks makes possible a combination of every fraction in steps of $\frac{1}{64}$ from $\frac{1}{32}$ to $2\frac{63}{64}$ in., inclusive.

Every gage is etched with its individual size clearly and legibly marked and is of uniform depth. The etched markings are free from even the tiniest burrs. In addition to the size marking, each gage is individually etched with its own serial number so that it can always be identified from similar size gages of other sets.

These gage blocks meet or exceed the requirements for gage blocks as established by the U. S. Bureau of Standards. Each individual block is stabilized by six cycles of annealing and freezing to –120° F. The resultant stabilized gage will not change more than a few millionths of an inch over a period of many years. The 118-piece set is available in three grades of accuracy: 0.000002 in., for laboratory use; 0.000004 in., for general inspection; and 0.000008 in., the working set.

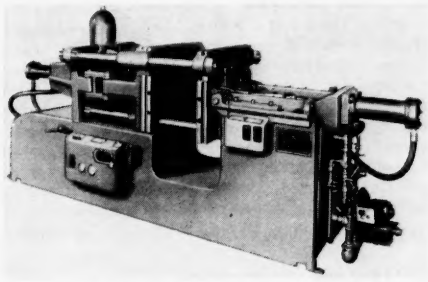
Mention R778 When Writing or Using Reader Service.

CONVERTIBLE DIE CASTING MACHINE

Kux Machine Co.,
3930 West Harrison St., Chicago 24, Ill.

This Model BH-18 hydraulic convertible die casting machine has a plunger gooseneck injection unit for lead, tin and zinc base die castings and a cold chamber hand ladling injection unit for aluminum as well as magnesium die castings. Either metal injection unit can be dismantled from the machine and replaced by the other in less than an hour.

The zinc plunger gooseneck unit consists of a bridge which supports the gooseneck, plunger and nozzle and holds the gooseneck suspended in the melting pot, located



with its furnace within the frame of the machine. The plunger is operated by a hydraulic ram permanently mounted below and to one side of the melting pot, at the side of the main frame. A bell crank lever is the operating medium between the hydraulic ram and the plunger. This design prevents oil leakage into the melting pot and furnace and reduces to a minimum over-heating of the hydraulic oil from direct over-head contact with the heat of the furnace.

The cold chamber, hand ladling injection unit for aluminum, magnesium or brass, consists of a supporting bridge which carries the hydraulic operating ram and injection plunger. The plunger sleeve containing the ladling well mounts to the back of the stationary die plate. The installation of this unit is simply and easily made. After mounting in place, the connection of two hydraulic cylinder hose couplings, the turning of a valve handle and the operation of an electrical switch is all that is necessary to ready the mechanism for operation.

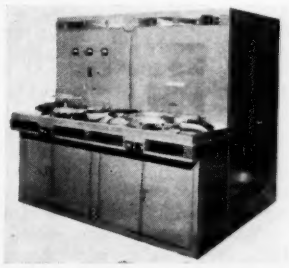
Machines are available with a die space between the bars of 18x18 in., 18x30 in., or 50x25 in. Castings weighing as much as 25 lb. in zinc and 10 lb. in aluminum can be made under injection pressures as high as 25,000 psi. Copies of a complete catalog covering specifications on all Kux die casting machines are available.

Mention R779 When Writing or Using Reader Service.

50-KW. ELECTRONIC HEATER

General Electric Co., Industrial Heating Division
Schenectady, N. Y.

A new 50-kw. electronic heater for surface and localized hardening of gears, rods and other parts and for annealing, brazing, and soldering operations is announced by this company. The new heater incorporates all of the important features of the 5-kw. and 15-kw. G. E. heaters and in addition is capable of heat treating much larger parts or the same size parts in less time. This heater is readily applicable for many different heating jobs merely by changing the induction coil fixture.



Available in models rated either 230 or 460 volts, 3 phase, 60 cycles, this heater is easy to operate. The parts to be heated are positioned in the fixture, and the start button is pressed. Automatic controls then regulate the heating and quenching cycles, assuring duplication of results on each part. An attached work table provides two heating positions, permitting full utilization of the high frequency power supply to secure maximum production. The entire unit weighs approximately 6000 lb. and is 84 in. wide, 94 in. deep, and 82 in. high over-all.

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OIL AND COOLANT STRAINER

George Butler Company,
1072 West Washington Blvd., Chicago, Ill.

The Metex strainer, used on machine tools for straining cutting oils and coolants and for other installations using flood oiling has several features.

No strainer housing is required, the strainer is installed in the tank and the oil or coolant is piped direct from strainer to pump. Strainer units are a unique combination of wire and cotton, inter-knitted into a mesh by machines especially developed and designed for this purpose. This makes a strong, non-collapsible strainer unit. All of the strainers have a large strainage area. They have exceptional capacity to hold dirt, grit and chips in the larger units where there is sufficient space for installation. The units are replaceable and slip in and out quickly and easily. They are available in many sizes and models rated from 2 to 60 gal. per min. and for use with all commercial grades of lubricating oil and coolant.

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MANUFACTURERS' CATALOGS IN REVIEW

Beryllium-Copper Castings

Beryllium Corp. of Pa., Reading, Pa.

This 16-page freely illustrated catalog gives considerable information on the casting characteristics of beryllium-copper. Valuable information is presented on physical properties of some beryllium-copper alloys; recommendations on heat treatment; machining practice; and descriptions of some parts that have been made in beryllium-copper during the past year where no other alloy was satisfactory. The qualities of beryllium-copper wrought material have been well known to engineers and designers, but the properties of beryllium-copper castings have but recently been brought to the fore. It is said that in many critical wartime applications beryllium-copper castings have been found to possess greater qualifications than steel forgings. High among the unique properties of a beryllium-copper casting is its extreme resistance to impact. Also, its excellent resistance to salt corrosion has made it mandatory in applications requiring continued exposure to atmosphere harmful to ferrous metals. The excellent fluidity of molten beryllium-copper allows it to fill fine interstices and facilitates the casting of precision parts, to the extremely high strength and hardness values which can be developed by heat treatment.

Mention R782 When Writing or Using Reader Service.

Electrode Furnaces

A. F. Holden Co., New Haven 8, Conn.

This 4-page folder shows the standard types of electrode furnaces built for operations such as annealing of brass shell cases, heat treatment of tool steels, high speed steels and production steels, either S.A.E. or N.E. Line drawings illustrate construction of four types and the simplicity of operation. Furnaces cover a range of temperature from 300 to 2350° F. Heating capacity in pounds of steel per hour is shown for each furnace.

Mention R783 When Writing or Using Reader Service.

Heat Treatment

American Institute of Bolt, Nut and Rivet Manufacturers, 1550 Hanna Bldg., Cleveland 15, Ohio

Heat treating procedures and equipment for bolts are typical of those usually applied to small parts, according to an interesting article by L. S. Cooch, metallurgist, Buffalo Bolt Co., appearing in **Fasteners**, volume one, number four, published by this Institute. Mr. Cooch discusses the equipment that is a key factor in the production of numerous sizes and kinds of bolts with uniform physical characteristics from various grades of steel.

The equipment consists of three important parts, which must function properly, both individually and collectively, to produce high quality products. These parts are the furnace, the gas generator, and the quenching equipment. The article is illustrated and shows the types of furnaces used, a comparison of the unburned gases from two types of generators and the raw gas used together with photomicrographs representative of production from the different types of furnaces and generators. Photomicrographs also show a comparison of identical samples quenched under identical conditions but with a different quenching oil in use over a period of time.

This interesting issue of **Fasteners** also contains articles dealing with the experience of railroads with fasteners, the torque-tension ratio in the application of fasteners, and an interesting discussion on "How Tight Should a Bolt Be?"

Mention R784 When Writing or Using Reader Service.

Drop Forging Topics

Drop Forging Association,
605 Hanna Bldg., Cleveland 15, Ohio

Seven progressive steps which develop strength and toughness in drop forging are illustrated and described in an interesting article in the November-December issue of **Drop Forging Topics.** The article points out that forging kneads the metal into a dense mass of strength and toughness. The forging operations, such as rolling, hammering, or upsetting, concentrate grain structure and fiber formation at points of greatest shock and stress to obtain maximum tensile and impact strength, toughness, and high fatigue resistance.

Other features of this issue are articles dealing with the survey of what is ahead in forging, the refinement of grain structure by forging, a review of the drop forging activities at the recent Metal Show and a list of technical booklets on "Closed Impression Die Forging" that are available.

Mention R785 When Writing or Using Reader Service.

Electric Welded Tubing

Formed Steel Tube Institute,
Keith Bldg., Cleveland 15, Ohio

This 32-page booklet shows how electric welded tubing can be worked by many processes into countless useful parts for a wide variety of products. The production of the tubing itself is described and the book is filled with illustrations showing many peacetime and wartime uses for tubing that will give many ideas for postwar application of this material.

Mention R786 When Writing or Using Reader Service.

Steam Jet for Pickling Tanks

Youngstown Welding & Engineering Co.,
3701 Oakwood Ave., Youngstown 9, Ohio

This new steam jet agitates pickling liquid in any size tank and is described comprehensively in this new leaflet. Strength of pickling acid is kept uniform in all parts of the tank with this steam jet. It may be located anywhere in the tank, is easily installed, and the investment is low in cost. In long and big tanks, as well as in smaller ones, the pickling action at the back end or corners of the tank is just as rapid and efficient as in any other part. The result is that pickling is faster and better.

The jet is made of wrought Monel, and the parts are securely welded with Monel electrodes, thus making the entire apparatus resistant to corrosive action of the pickling solution. Made of heavy gage Monel with high tensile strength, the jet is practically unbreakable. The jet was primarily designed for sulphuric acid pickling solution; for special applications it is available in stainless steel, nickel, Inconel or any weldable metal. For very long tanks (over 25 ft.) special extensions are available.

Mention R787 When Writing or Using Reader Service.

High Temperature Insulation

Laclede-Christy Clay Products Co.,
Ambassador Bldg., St. Louis 1, Mo.

High temperature insulating cement and blocks are described in this 4-page leaflet. Various characteristics and many applications of Laclede 48 cement and blocks are shown.

Mention R788 When Writing or Using Reader Service.

Gas Cutting Tips

Air Reduction Sales Co.,
60 E. 42nd St., New York 17, N. Y.

This new 12-page bulletin describes Airco 45 and 45M high speed machine gas cutting tips which control the expansion of cutting oxygen. Cross-sectional drawings and photographs clearly show how the especially designed orifices in these tips release a high velocity stream of oxygen to cut a narrower path or kerf than the standard cutting tips. Cutting steel plate of various thicknesses up to 8 in., most tips give the user better than a 20% increase in cutting speed with no increase in gas consumption per inch of cutting. Photographs show how the newer 45M tip is designed for heavier preheat, making it particularly adaptable for cutting rusty and scaly plate, bevel cutting, and cutting with hydrogen as a fuel gas. Other illustrations, charts and tables, give valuable specification data.

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Aluminum Alloys

The Oscar W. Hedstrom Corp.,
4838 West Division St., Chicago 51, Ill.

"OH-38" is an improved aluminum alloy which may be sand cast with a finish usually obtainable only by die casting. Heat treatment is unnecessary for the strength, hardness and ductility are said to surpass these properties in many heat treated aluminum alloys. This leaflet gives details of its characteristics, its application and a list of users.

Mention R790 When Writing or Using Reader Service.

Photo Facts File

The Bellows Co., 861 E. Tallmadge Ave., Akron, Ohio

This facts file folder contains 25 large photographic prints representative of installations of Bellows equipment in plants all over the United States. Each photograph has in itself an interesting story of how the ingenuity of the company's tool engineers has solved difficult production problems. In virtually every instance the installation of this equipment has meant not only faster production but better production and safer production as well. On the reverse side of the photographs the complete story of each specific application is given together with the cost of the Bellows equipment used.

Mention R791 When Writing or Using Reader Service.

Houghton Products

E. F. Houghton & Co.,
303 West Lehigh Ave., Philadelphia 33, Pa.

This company has issued two new leaflets with one devoted to line of products for the metal industry. Grouped according to application, these products are concisely described and their applications indicated.

A second leaflet describes Cosmoline fingerprint neutralizer. It is pointed out that one of the causes of corrosion of metal surfaces, particularly highly polished or super-finished pieces, is perspiration from the hands of workmen handling such pieces. This condition must be neutralized before a final application of rust preventive can be permanently effected.

Mention R792 When Writing or Using Reader Service.

Booklet for Resistance Welding

Resistance Welder Manufacturers Association,
505 Arch St., Philadelphia 6, Pa.

Written for the non-technician, this booklet, "Tomorrow's Production Today by Resistance Welding," is a brief review of what resistance welding has accomplished, what it is now doing to speed the war effort, and what its future possibilities for post-war metal fabricators will be, because of lessons learned under stress of war.

The chapter on "This Is Resistance Welding" gives a brief explanation of each of the basic types of resistance welding and their applications. Other chapters include its advantages, what it has done, its future and welding at work.

Mention R793 When Writing or Using Reader Service.

Eliminating Corrosion

Amercoat Division, American Pipe and Construction Co., P.O. Box 3428, Terminal Annex, Los Angeles 54, Calif.

Many practical suggestions for eliminating corrosion and contamination in your business will be found in a new technical bulletin titled: "Amercoat No. 23 Plastic Coating." This bulletin describes the many proven uses of this general purpose, cold-applied plastic coating in a wide range of industries. Technical features and product advantages are also covered in this four-page leaflet.

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Deburring and Finishing

Sturgis Products Co., Sturgis, Mich.

A revolutionary new method of deburring and finishing metal parts and castings is described and illustrated in a new folder entitled "Slash Time and Cost With Roto-Finish." The leaflet shows how hand methods for deburring and finishing are eliminated, and these jobs performed mechanically on a production line basis with the Roto-Finish process.

Mention R795 When Writing or Using Reader Service.

Melting Furnaces and Foundry Accessories

Fisher Furnace Co.,
5535 North Wolcott Ave., Chicago 40, Ill.

This company has issued two publications, one a condensed catalog illustrating and describing the complete Fisher line of melting furnaces. Recommended applications, capacities and dimensions are given. This catalog also presents centrifugal blowers, combination blower and oil pump units, oil burners, silicon carbide linings, and other information.

Bulletin 600 is another booklet illustrating and describing a wide range of accessories including combustion controls, temperature controls, thermocouples and lead wire, blast gates, valves, mixers, gages, strainers, pumps and innumerable other items.

Mention R796 When Writing or Using Reader Service.

Electric Heat Treating Furnaces

Hevi Duty Electric Co., Milwaukee, Wis.

This attractive 44-page booklet describes the Hevi Duty line of electric heat treating furnaces. A wide range of industrial furnaces including high temperature box furnaces, car bottom, nitriding car type, rotary and roller hearth, oil bath tempering, low temperature convection, and vertical retort furnaces are described and pictured. Arrangement of laboratory furnaces is also shown. Actual photographs are used throughout to give detail and interest to this attractive booklet.

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The Metals REVIEW
THE MONTHLY SURVEY AND DIGEST OF WHAT'S NEW IN METALS

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